

Vol. IV

OCTOBER, 1922

No. 4

THE
AMERICAN JOURNAL
OF
OBSTETRICS AND
GYNECOLOGY

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Published Monthly by
THE C. V. MOSBY COMPANY
ST. LOUIS

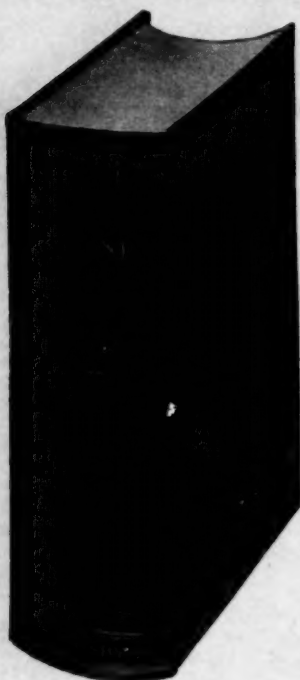
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(Entered as Second-Class Matter October 28, 1920, at the Post Office at St. Louis, Mo., under the Act of March 3, 1879).

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The American Journal of Obstetrics and Gynecology

VOL. IV.

ST. LOUIS, OCTOBER, 1922

No. 4

Original Communications

THE UTERUS AFTER CESAREAN SECTION*

By EDWARD P. DAVIS, M.D., PHILADELPHIA, PA.

AS CESAREAN section has become established as one of the standard and important operations of obstetric surgery, we have come to the stage of studying, not only the best method of performing the operation, but also the after-history of patients upon whom the operation has been done. Not only must the patient recover from the operation if we are to be successful and her child also survive, but she must be left in such a condition that if her pelvis is of sufficient size, she may give spontaneous birth after a subsequent pregnancy. Another problem which enters the field of cesarean section is the question of birth control. Cesarean section is often performed for conditions which make spontaneous labor on the part of the patient impossible if a living child is to be secured. Unless the pregnancy for which the first operation is done is to be the last, each succeeding pregnancy means additional danger. Must each cesarean operation terminate in sterilization, or has the patient a fair prospect if the pelvis is sufficiently large, of being successful in spontaneous labor in subsequent pregnancies? In addition to this problem, birth control presents itself in another phase. The obstetrician is often called upon to treat multiparæ who are near the final limit of healthy child-bearing. Many of these are women in straitened circumstances, who have as many and some of them more children than they can properly rear. Many have reached the stage of physical degeneration where future pregnancies will become progressively dangerous. Under these

*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, May 1 to 3, 1922.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

conditions, may not the performance of cesarean delivery be followed by sterilization? This is to be so done as to remove practically all of the pelvic generative organs, hasten a menopause and relieve the woman of the dangers of disease which often arise after the age of child-bearing. The condition of the uterus in these patients is an important factor in deciding these questions. Where sterilization is not effected and the patient elects a possible future pregnancy the method of suture of the uterus is of paramount importance. The writer's paper is based upon his experience in these matters, and he would endeavor to show the actual condition of the uterine muscle after cesarean operation.

Much attention has recently been called to the danger of rupture of the uterine scar after cesarean section. We are now familiar with the statistics of Holland and with the review which British obstetricians have given to the subject of cesarean section. From this contribution to the literature of the subject it may be concluded that where catgut is used to close the uterine muscle in cesarean section, that there is danger of rupture in subsequent pregnancy of about 4 per cent. This is true in cases where the classic celiohysterotomy has been done. Where silk has been used the danger of rupture is less, while it is thought that the ideal suture material would be silk-worm gut.

To understand the causes which lead to rupture of the uterine scar after cesarean section, one must revert to the conditions normally present after the uterus is emptied. By autolysis the uterus undergoes rapid diminution in size, bulk and area. Intermittent contraction and retraction of the uterine muscle is essential. If to this activity there be added the destructive agency of bacteria, greater in number than those normally found in the uterus, and if these bacteria gain unusual access to the placental site, an infective process is added to autolysis. The result of these processes is to soften the uterine muscle, cause its more or less rapid absorption, and where infection is present, to have bacteria reproducing these constantly, and finding their way along lymphatics to adjacent tissues. The resistance of these tissues results in the formation of adhesions, and if the infective process bursts through these, fistulae may develop.

A suture material placed in such an organ as the uterus will disappear through the action of cellular elements, unless it be impervious and resisting. Hence if the uteri be examined where silk has been used in closing and infection has not developed, no trace of the silk may be found. Catgut disappears much more rapidly with the unfortunate addition of the rapid loosening of the knot in the suture. From this cause fatal postpartum hemorrhage has developed. Where infection occurs the natural absorption is prevented, the stitchknot becomes a foreign body, and as bacteria make their way through the

tissues, a fistula is formed through which the foreign body may be expelled.

While the choice of suture material is important, we know that in the classic operation the efficient and accurate closure of the uterine muscle is indispensable; while methods of operation may differ, this must be accomplished.

It is a general principle of surgery that rapid and complete union in wounds is not to be expected in patients whose general condition and power of resistance are greatly vitiated. This holds good in cesarean section, and the obstetrician may be called upon to effect delivery in cases where the general condition of the patient is so bad that it is unsafe to suture the uterus and allow it to remain. This would limit the choice of operation to embryotomy or hysterectomy. Not only could prompt and successful union not be expected but should a subsequent pregnancy develop such a condition renders any form of delivery especially dangerous. Rupture of the uterus may occur during embryotomy, version or any manipulation where the membranes have long been ruptured, and the uterus has contracted and retracted upon the body of the child.

Cesarean section by incision through the lower uterine segment is said by those who practice it to be less dangerous for subsequent pregnancy. Our experience is not up to the present time sufficient with this operation to justify accurate comparison with the older and classic section. So far as the experience of the writer is concerned, he has on several occasions operated upon patients upon whom the operation by the low incision had previously been done. In two of these cases adhesions had formed so dense and resisting as to render the action of the uterus in labor inefficient and delayed, preventing a proper presentation and making inevitable the second delivery by section. It is greatly to be hoped that this method of operating may ultimately prove of definite advantage, both at the time of operation and in the patient's subsequent history.

The writer has had several opportunities to examine the uterine scar after the classic cesarean section. The second delivery of these patients was accompanied by hysterectomy; and hence the body of the uterus was available for study. All of these patients had been operated upon by the same method, namely, the turning out of the uterus from the abdominal cavity, incision through the expulsive segment, the emptying of the uterus and, in suspected cases, packing of the cavity. Uterine muscle was closed by buried silk sutures, the peritoneal covering of the uterus with catgut. In none of these cases had septic infection developed after the first operation. In those who are allowed to remain in the Maternity sufficiently long, a very fair degree of convalescence has been obtained. These five patients were married Caucasian women, the wives of artisans, caring for

their children and doing the housework. They belong to that class of persons in the community upon whom the burden of life falls especially heavily. In none of them was there evidence of syphilis, alcoholism or other especially complicating features. The cases are as follows:

CASE 1.—White, aged 30. Cesarean section eight years previously by myself, by the method described. The child lived for six months, dying from some cause not clearly stated. Five years after this the patient had twins by spontaneous labor. She was admitted to the Philadelphia General Hospital in the service of Dr. E. A. Schumann and found to be pregnant about eight months. Blood pressure 154-68, pulse 122. Pelvic measurements practically normal but patient was very obese and examination was difficult. There was no engagement of the presenting part. Urine showed albumin and casts, and there was marked swelling of the legs. The membranes ruptured early and a feeble attempt at labor developed with the head presenting. Supravaginal hysterectomy was performed by Dr. Schumann and very extensive adhesions found between bowel, omentum and anterior uterine surface. The child did well after birth. The patient's convalescence was complicated by nephritis and superficial wound infection.

On examining the body of the uterus removed there was a poorly defined furrow on the anterior fundal surface marking the line of incision at the first cesarean section. Microscopic examination of this area showed in the line of the scar, loose connective tissue and a highly vascular condition with widely dilated blood vessels. In the uterine muscle adjacent to the scar the muscle bundles were placed irregularly in the vicinity of the scar. The scar, however, was sound and was holding firmly.

CASE 2.—Aged 41, married at 19, who had had nine pregnancies, two of which ended in abortion. In 1914 the writer had performed section upon this patient and since then she had one child born by forceps. A section was done for placenta previa and followed by uninterrupted and normal recovery. The patient had come to the Clinic of the Jefferson Hospital complaining of malaise and showing old lacerations and relaxations. She had been fairly nourished but had suffered from more or less privation and poverty. Dr. Anspach performed trachelorrhaphy, anterior and posterior colporrhaphy, excision of the adherent omentum, release of adhesions and supravaginal hysterectomy. The body of the uterus taken from this patient was apparently normal. There was a moderate degree of subinvolution and on microscopic examination sections taken transversely across the anterior surface of the uterus and across the scar, showed everywhere a muscle wall practically normal in appearance. There was some slight hypertrophy of the muscular tissues. Blood vessels were large and numerous, but at no place could scar tissue be seen. The endometrium showed in some portions cystic endometritis and one small area of decidual tissue was seen. The specimen gave no evidence of an operative scar. This case illustrates the fact that a multipara, under worse than average conditions of nutrition and hygiene, subjected to abdominal cesarean section for placenta previa, made a complete anatomical and physiological recovery, giving birth subsequently to a child with the help of forceps and required operation only to repair the lacerations and injuries following delivery through the vagina.

CASE 3.—Multipara, aged 29, who previously had five labors including one forceps delivery and one cesarean section for placenta previa. This patient was

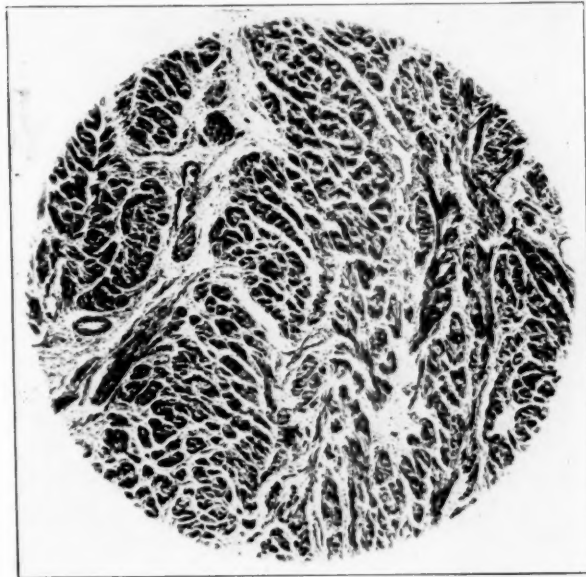


Fig. 1.—Case 1. Mrs. S. Section from cesarean uterus taken transversely across anterior surface, showing myometrium practically normal, numerical hypertrophy of slight degree and blood vessels large and numerous; no trace of scar.

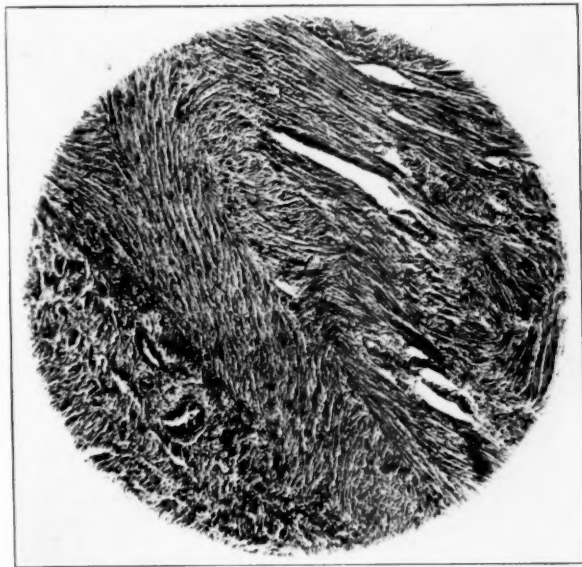


Fig. 2.—Case 1. Mrs. S. Cesarean uterus with normal uterine muscle and no trace of scar.

in the out-patient service under the care of senior students and instructors. She went into spontaneous labor and continued for a short time when progress ceased. There was a breech presentation but the condition seemed favorable for spontaneous birth. She became unduly restless with difficulty in breathing but without shock. She had vague abdominal pain without bleeding. On palpating the abdomen it



Fig. 3.—Case 2. Mrs. V. Section through uterine scar showing a group of widely dilated blood vessels.

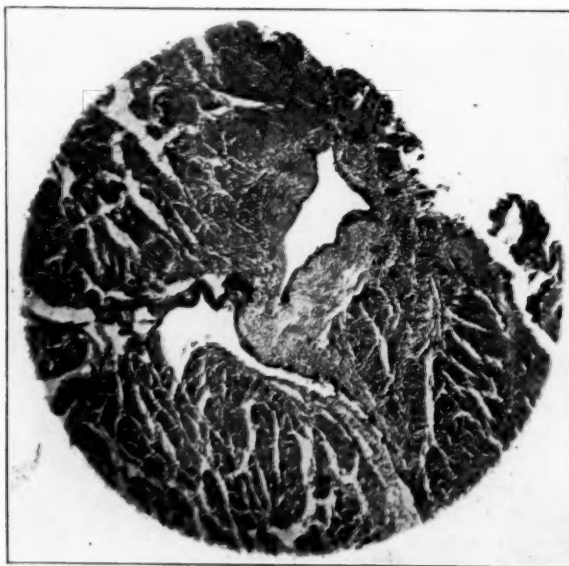


Fig. 4.—Case 2. Mrs. V. Section through uterine scar showing irregular placing of muscle bundles with increased muscularity.

seemed as if a portion of the child could be felt with unusual ease through the abdominal wall, it was suspected that rupture of the uterus was developing. The patient was brought by ambulance to the Maternity and abdomen opened as soon as possible. There were no adhesions but at the upper extremity of the scar the tissue of the uterine fundus had ruptured. The head of the fetus was protruding and the shoulders had partially emerged from the uterus. Membranes



Fig. 5.—Case 3. Mrs. C. Section at edge of uterine rupture showing thinned out and torn muscle fibers.

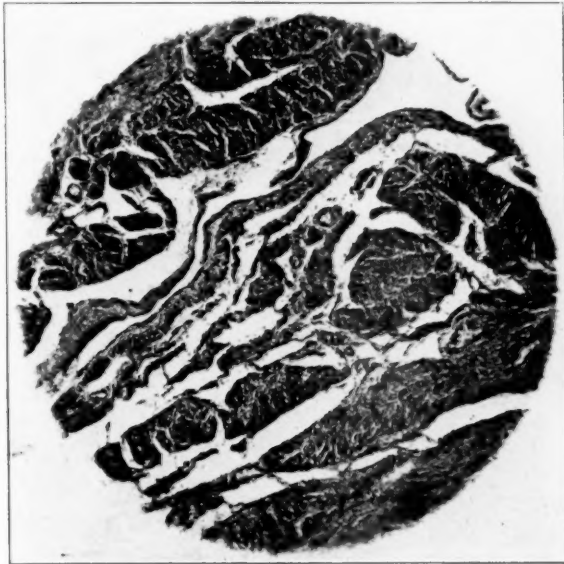


Fig. 6.—Case 3. Mrs. C. Section near line of rupture of uterus, showing thinned out muscular bundles with several small hemorrhages.

were unruptured. The child, a female, weighing seven pounds was dead. Hysterectomy was performed with dropped stump without drainage, the mother making a good recovery and leaving the Maternity in twenty days.

It is interesting in this case to note that rupture did not occur through the scar, but beginning at the upper extremity of the scar the rupture extended through the fundus. Evidently a process of autolysis had developed which had greatly

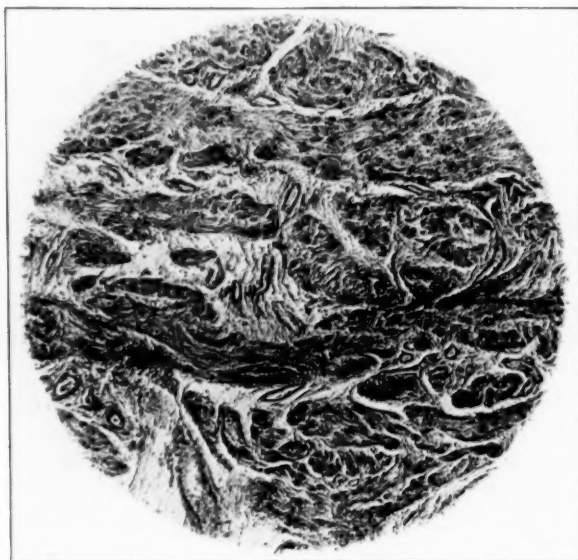


Fig. 7.—Case 4. Mrs. M. O. H. Rupture of cesarean uterus in beginning labor, marked fatty degeneration and atrophy of uterine wall.

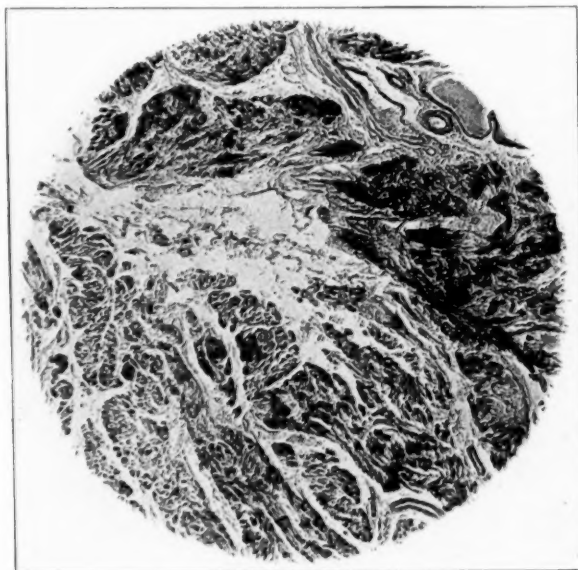


Fig. 8.—Case 4. Mrs. M. O. H. Ruptured cesarean uterus, marked fatty degeneration with atrophy of uterine muscle and occlusion of vessels.

softened the uterine muscle at this point, possibly the pressure of the fetal head had something to do with this result. So, far from the scar being the weakest place in the uterus, it was evidently stronger than the tissues at the fundus. Microscopic examination showed thinned out and torn muscle fibers with several small hemorrhages into the muscle substance.

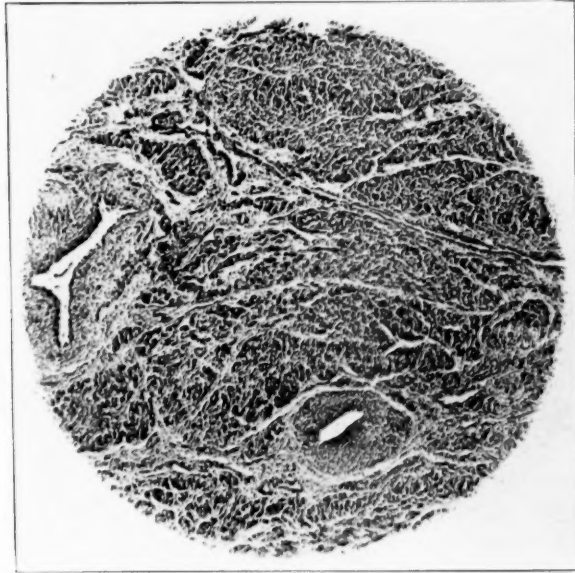


Fig. 9.—Case 4. Mrs. M. O. H. Rupture of cesarean uterus in beginning labor from fatty degeneration of uterine muscle. Vessels occluded, "moth eaten" appearance.

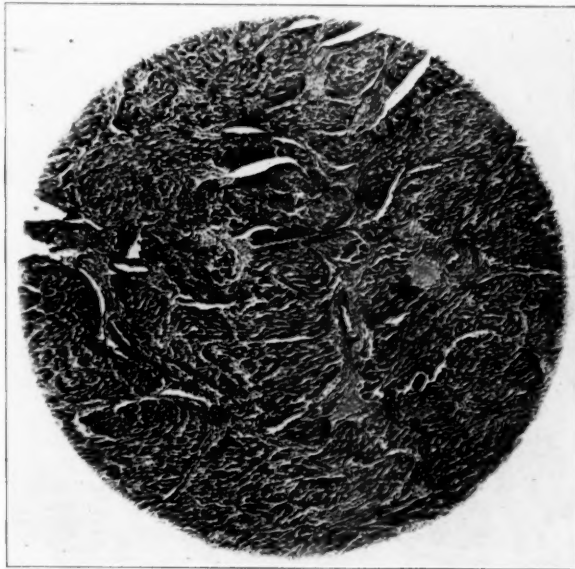


Fig. 10.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fibrosis and atrophy of uterine muscle.

CASE 4.—A Polish woman who had lost several children in difficult labors and had been delivered by abdominal cesarean section because of disproportion and failure of mechanism in labor. She was brought in after a number of hours of labor with examinations made by others than the Staff of the Maternity. During her convalescence from section she had some elevation of temperature but nothing

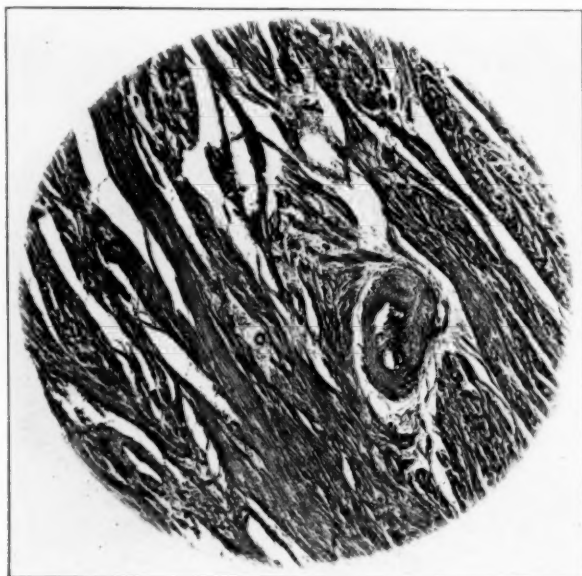


Fig. 11.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, thickening of blood vessels, fibrosis and atrophy.

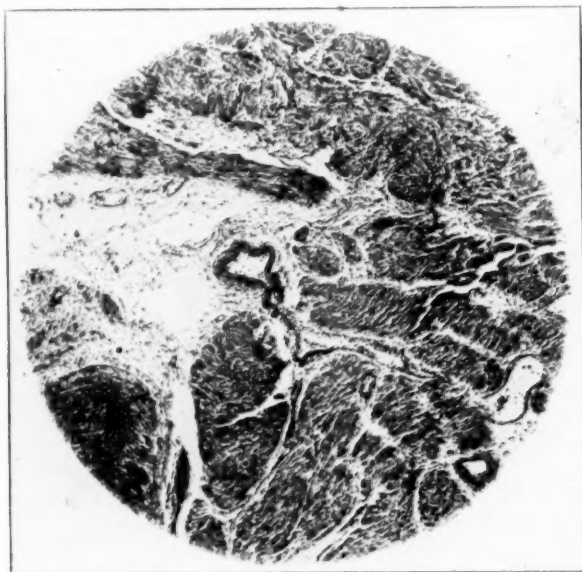


Fig. 12.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fatty degeneration of uterine muscle.

which indicated a severe septic process. She had reached the last week of her convalescence when her husband insisted upon taking her home against the advice of the medical staff. About two years afterward she returned in the pregnant condition in very bad physical state. She had been habitually overworked and underfed and although ordinarily a stout woman, her tissues were exceedingly flabby and lacking in tone. She was told that she must come into the Maternity

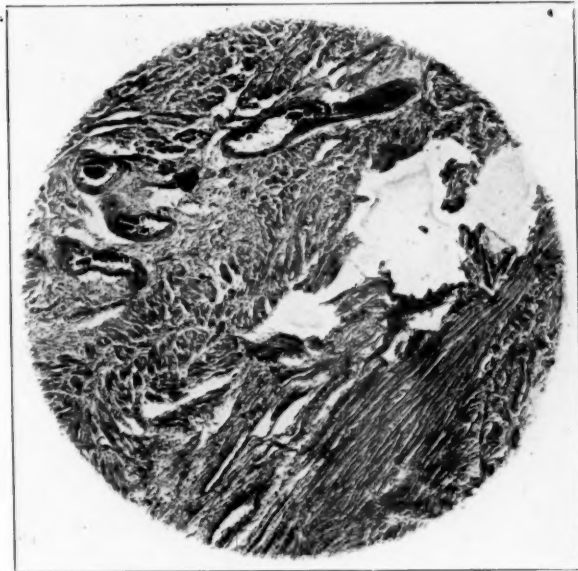


Fig. 13.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, infiltration of leucocytes at junction of placenta and uterine wall.

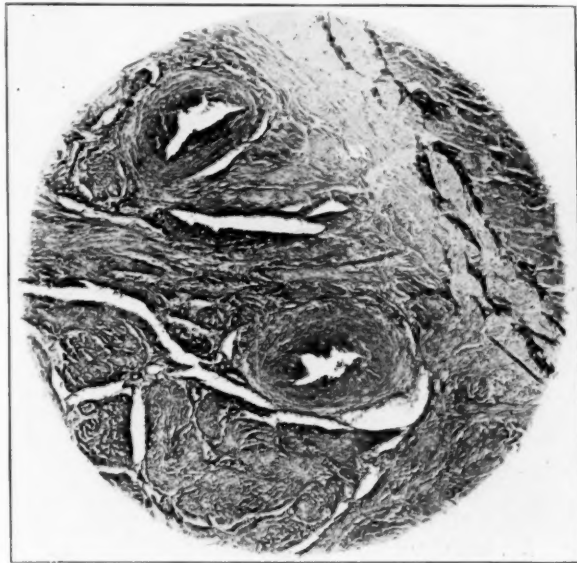


Fig. 14.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, marked thickening of blood vessels.

early in the last month of her pregnancy to receive appropriate treatment with the hope of avoiding further operation. This the patient promised to do but her husband prevented her from coming as he wished her to do the house work at home. She was brought to the Maternity by a physician who had been called to attend her. The patient had been taken in labor and after a few pains developed serious

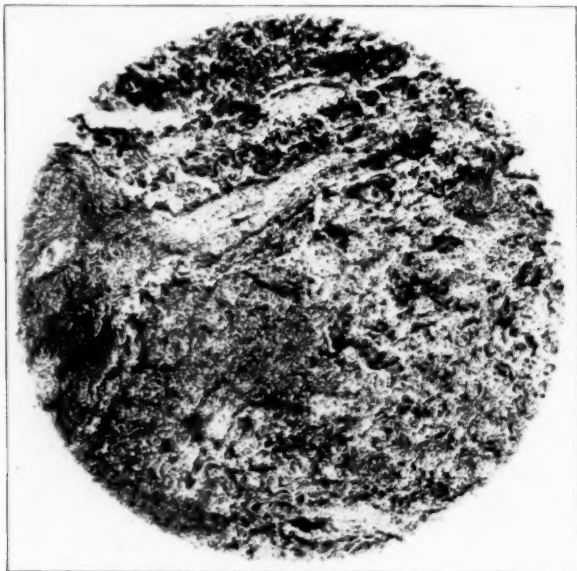


Fig. 15.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, infiltration of leucocytes at junction of uterus and placenta.



Fig. 16.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, uterus and placenta, cellular infiltration.

shock with some hemorrhage. The physician who saw her at the house diagnosed rupture of the uterus and brought her immediately to the hospital. On examination the patient was profoundly shocked, fetus could be clearly made out in the abdomen. An emergency section was done as soon as possible, so desperate was the patient's condition, that all that could be done was extract the fetus and

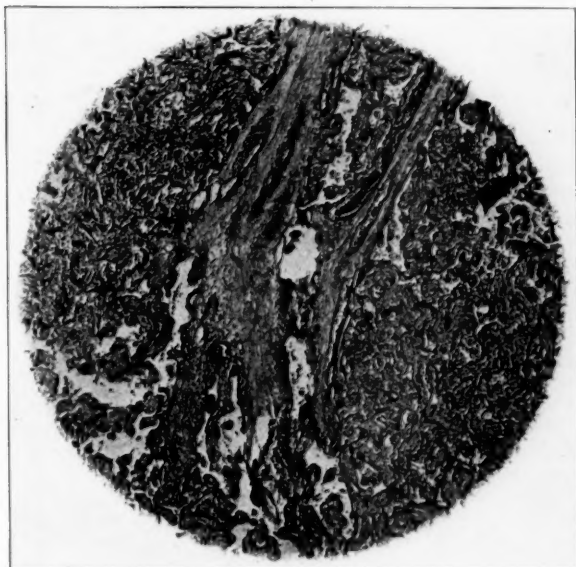


Fig. 17.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, placenta showing fibroblastic proliferation.

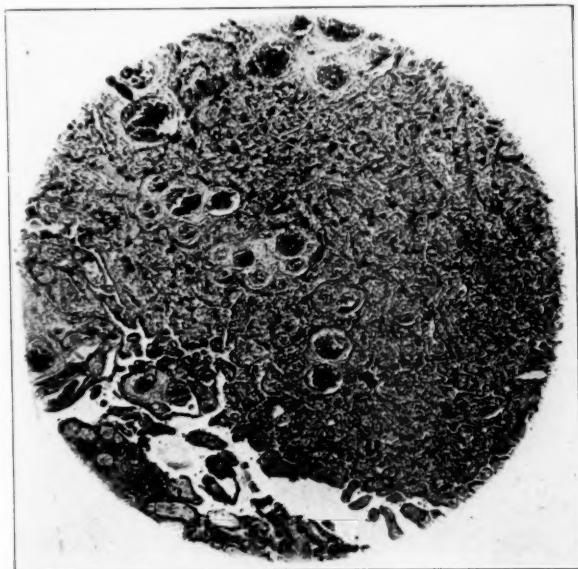


Fig. 18.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, placenta showing occlusion of vessels, fibroblastic changes.

appendages when the patient died, the child was dead. Examination of the uterine body showed fibrosis uteri, atrophy of the uterine muscle with marked fatty degeneration.

CASE 5.—A multipara aged about 43, who had given birth to several children spontaneously and had been the main support for some years of her family. Her

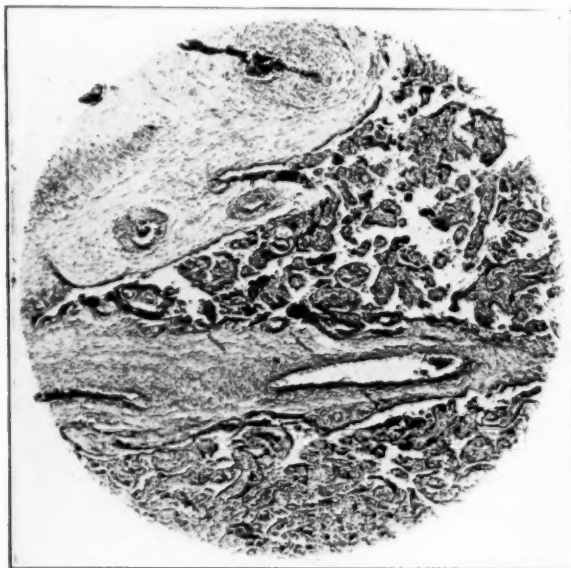


Fig. 19.—Case 5. Mrs. M. I. T. Cesarean section, placenta showing marked fibrous change.

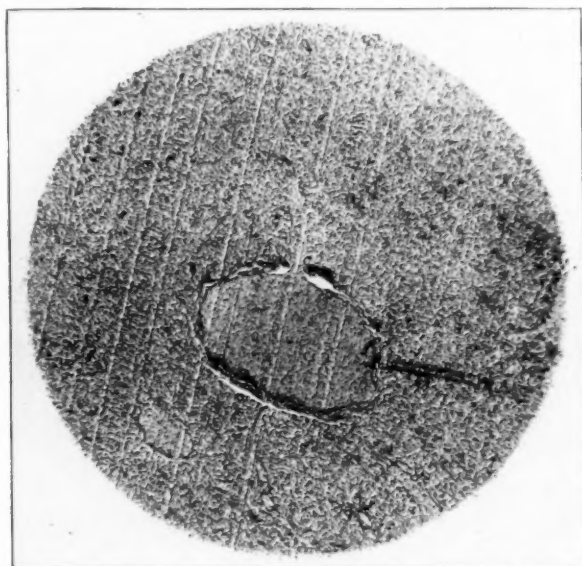


Fig. 20.—Case 5. Mrs. M. I. T. Cesarean uterus, toxemia, fetal liver normal.

husband had been in ill health and she had succeeded in rearing her children well and caring for the family. A section had been done several years previous for placenta previa followed by complete recovery. The patient came to the Maternity in a highly toxic condition, the urine showed albumin and casts, blood pressure abnormal. The patient was poorly nourished and she and her husband requested that with the delivery of the child sterilization should be performed. She was accordingly delivered by elective section without labor, followed by supra-

vaginal hysterectomy, removal of the tubes and ovaries and appendix. During the operation the patient received an intravenous saline transfusion and passed through the operation in very fair condition. About eight hours after she was taken with sudden and severe dyspnea with great distress, from which she rallied under stimulation. Immediately following the right arm and hand became swollen, dark in color and cold, external heat was at once applied but dry gangrene developed in the thumb, index and portions of the second finger of the right hand. The patient went through a tedious but very fair recovery. She was seen in consultation by a surgeon and by an anatomist. The circulation in the arm became re-established and in the greater portion of the hand. She was transferred to the surgical department where the gangreous portions of the thumb and fingers were amputated. Although crippled by the condition of the hand the patient is able to be about and do considerable work. The pelvic condition is good. Her child did not long survive delivery and died apparently from inanition.

The specimen in this case was sent to the pathologist without diagnosis and no clinical history was appended and this point is of interest as will later become apparent.

On microscopic examination of the tissues fibrosis uteri with atrophy of muscle bundles was found but the blood vessels in the uterus and in the placenta and the tissues at the junction of the placenta and uterus showed great thickening in the walls, and a very abundant infiltration with round cells.

The pathological condition was that of marked toxemia and the pathologist knowing nothing of the previous history, strongly suspected syphilis. Accordingly a very thorough search was made for the spirochaeta and this search was unsuccessful. The Wassermann reaction in the patient had been negative. The case is a most interesting example of the condition of the uterus in advanced toxemia. Grafted upon the fibrosis uteri and atrophy of muscle bundles which develops in poorly nourished multiparae, we have the evidence of occlusion of blood vessels and extensive round cell infiltration. The liver of the fetus was normal and there was no reason whatever to suspect a specific element in the case.

These cases illustrate the following facts of considerable clinical importance:

The method of performing cesarean section in the first operation on these patients consisted in closing the uterine muscle with silk and peritoneal tissue with catgut. Cases that had been examined outside of hospital, had been long in labor and brought in as emergency cases, were further treated by packing the uterus with iodoform gauze with the hope of averting serious hemorrhage and infection. This method was successful.

So far as rupture of the uterus in subsequent labor is concerned, in one case the uterine muscle ruptured but the scar remained firm and was stronger than the uterine muscle. In the second case, the uterus was the site of such fatty degeneration, that extensive rupture occurred as soon as labor began. This patient was given no opportunity to recover from her previous section and she was denied the benefit of hospital care during the last month of her pregnancy.

In all of these multiparae the degenerative processes which inevi-

tably occur in multiparae without proper care in their pregnancies and labors was present, namely, fibrosis uteri and atrophy to some extent of muscular tissues. In the patient toxic at the time of operation, fibrosis and atrophy were present but in addition we have the occlusion of blood vessels by emboli and thrombi and marked round cell infiltration at the junction of the placenta and uterus. The multiple embolism in the case of a toxemic patient is an unusual but natural illustration of the pathology of toxemia.

The writer believes that in this class of cases the evidence he presents strengthens the arguments for birth control by elective hysterectomy at term. These women had born children with difficulty and had done their utmost to rear these children at the expense of their own health and in one instance at the expense of life. Under these conditions and circumstances, the writer believes that such patients should be spared the dangers of further parturition by elective hysterectomy, no more practical application of birth control can be suggested. It should be the aim of obstetric science to relieve a mother who has done at least her share, from danger to her own life and also the risk of possible degenerative disease in the genital tract.

250 SOUTH TWENTY-FIRST STREET.

(For discussion, see p. 415.)

THE EXTENT OF THE RENAL LESION IN THE TOXEMIAS OF PREGNANCY*

BY ALFRED BAKER SPALDING, M.D., MARION C. SHEVKY, AND T. ADDIS,
SAN FRANCISCO, CALIF.

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A METHOD has recently been developed at the Stanford School of Medicine which measures the amount of actively functioning renal tissue in the living kidney.¹ The method is based on the observation that under certain special conditions the function of the kidney is limited by, and becomes a measure of, the quantity of effective tissue it contains.

These conditions comprise: first, the application of strain, so that all the functioning tissue present is called upon to exercise its maximum capacity; and second, a constancy in the environment of the organ, so that various factors which have a specific stimulating or inhibiting effect on the functioning tissue, are excluded. Strain is applied by administering by mouth large amounts of urea and water. The second requirement is met by abstention from food and by delay-

*Read at the Forty-Seventh annual meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

ing the measurements until three hours after the urea and water have been taken.

Two measurements are required: first, the amount of urea excreted in one hour's urine, and second, the amount of urea contained in 100 c.c. of blood removed at the middle of the period of urine collection.

Chart I shows that in the same individual, that is, where the amount of renal tissue remains constant, the amount of urea in one hour's

**THE UREA IN ONE HOUR'S URINE VARIES DIRECTLY WITH THE
UREA IN 100 C.C. OF BLOOD
WHEN THE AMOUNT OF RENAL TISSUE IS CONSTANT (I.E. IN THE SAME INDIVIDUAL)**

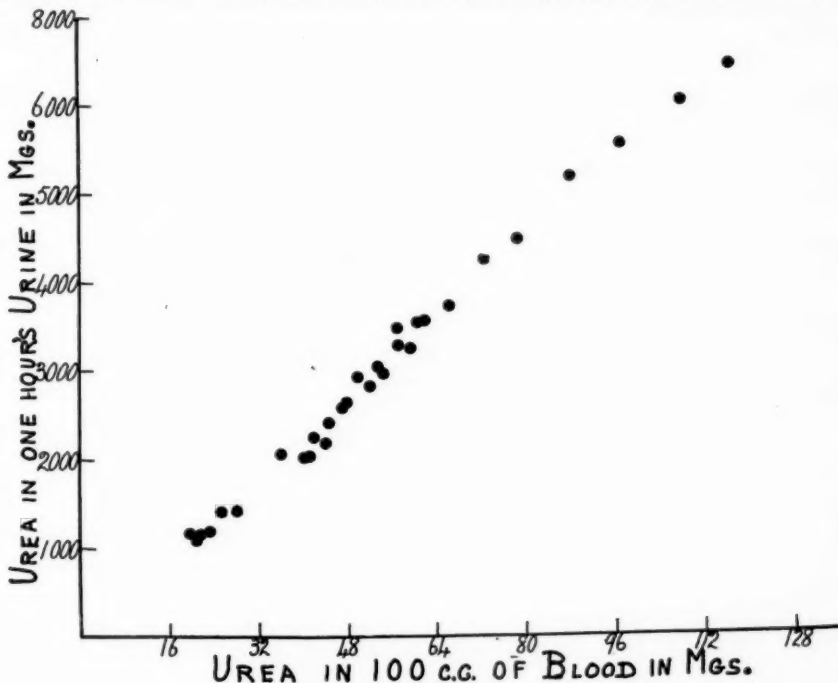


Chart I.

urine is directly proportional to the amount of urea in 100 c.c. of blood. The amount of urea in the blood, which is shown on the abscissa, was varied by administering successively larger and larger quantities of urea. It will be noted that under these special conditions with every increase in the blood urea concentration there is a proportionately equal increase in the amounts of urea excreted in one hour's urine, which is measured on the ordinate. The measurements were made on a normal adult man.

Chart II shows that in different individuals, that is, where the

amount of renal tissue varies, the ratio: $\frac{\text{urea in one hour's urine}}{\text{urea in 100 c.c. of blood}}$ which indicates the number of times the urea in one hour's urine exceeds the urea in 100 c.c. of blood, is directly proportional to the weight of renal tissue. The measurements were made on rabbits which were killed after the test so that the weight of both kidneys could be obtained. The kidney weight is measured on the abscissa.

It will be noted that as the weight of the kidney increases there is a proportionate increase in the magnitude of the ratio which is measured on the ordinate. From this and other experiments, it is concluded that the ratio: $\frac{\text{urea in one hour's urine}}{\text{urea in 100 c.c. of blood}}$ equals the

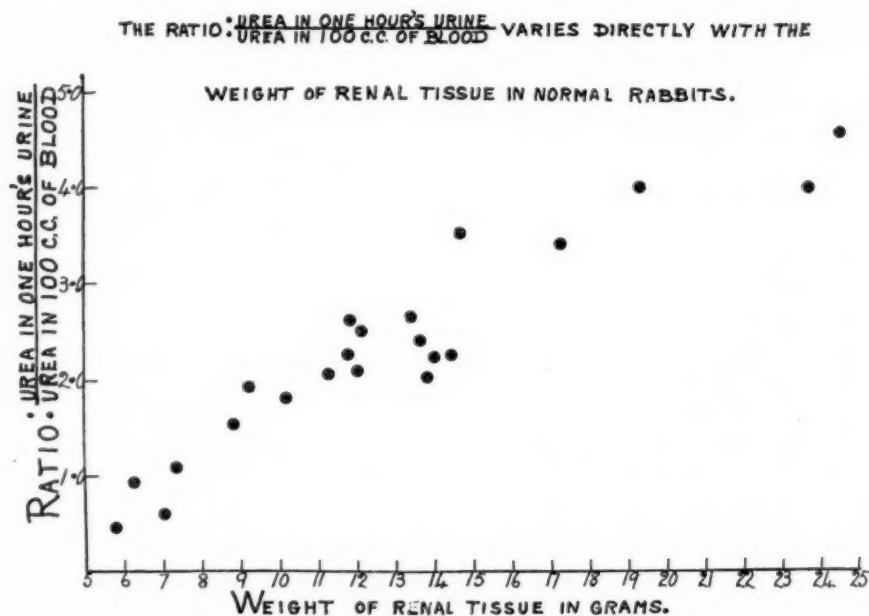


Chart II.

amount of effective renal tissue, provided that the conditions above specified have been fulfilled. Applying the test to 163 normal adult men, the average ratio was found to be 50.4 and this has been accepted as representing 100 per cent of normal kidney function.

As in normal individuals the usual 300 gram weight of kidney tissue varies more or less, so there exists a normal variation in the ratio test for function which has been noted in the series studied. In children, the ratio is always less than 100 per cent and with them there is a relation between the body weight and the ratio, just as there is between the renal weight and the body weight. More constant ratios would therefore probably be obtained in adults if the body weight

were introduced into the formula. In this study, however, correction for body weight has been made only in one of the subjects who was an exceptionally large woman, since in none of the other patients was there any marked variation in size and the validity of a correction based upon body weight alone is still uncertain. We believe the variability of the ratio in normal adults is largely due to the variations in the amount of kidney tissue they possess. This variation is of such an extent that in any single individual the ratio would have to fall below 75 per cent before we would be justified in supposing that the kidney was pathologically small. In a series of adult individuals, however, an average ratio appreciably less than 100 per cent would certainly be abnormal.

This paper deals with the ratio test applied to patients who developed hypertension, edema, and in some cases, convulsions, in the latter months of pregnancy and in whose urine evidence of a renal lesion was found in the form of albuminuria and casts. Because of the difficulties in obtaining accurately timed collections of urine and blood from patients who were too ill to leave their beds, we have been able to obtain accurate results from only a small number of patients, although the work has been in progress for more than a year and a half. In the acutely toxic patients we found that reliable results could be obtained only when the collections were made personally or under the close supervision of one or the other of the authors. In the less acute cases, the patients were brought to the laboratory where we ourselves could time the collections of blood and urine. All the results which we have thus obtained are given so that the chart represents a consecutive and unselected series.

The data obtained have been divided into three parts: first, ratios obtained on pregnant patients who were free from evidences of toxemia; second, ratios obtained from toxic patients before delivery; and third, ratios obtained from patients after delivery who had been toxic but whose hypertension, edema, and subjective symptoms had either disappeared or were in the process of disappearing.

Chart III shows the results obtained in normal pregnancy. It will be noted that the average result is 106 per cent, as compared with the average of 100 per cent obtained from 163 ratios on male adults whose kidneys were probably somewhat larger than those of women. This suggests that there may be some increase in the amount of effective kidney substance during pregnancy, although a larger series of cases would be necessary to prove this point. So far as our immediate problem is concerned, the figures show that the decrease found in toxic patients is a real decrease and not due to the pregnancy itself.

Chart IV shows the results obtained in toxic cases before delivery. In every case we succeeded in attaining a good diuresis with the ex-

CHART III
NORMAL PREGNANCY—BEFORE DELIVERY

CASE NO.	RENAL CAPACITY	BLOOD PRESSURE		ALBUMIN GMS. PER 24 HRS.	TIME BEFORE DELIVERY DAYS
		SYSTOLIC	DIASTOLIC		
1	107%	134	76	Trace	82
2	93%	116	70	Trace	119
3	123%	122	68	None	61
4	103%	128	85	Trace	9
5	101%	110	72	None	82
6	102%	110	82	None	69
7	108%	140	92	Trace	52
8	93%	98	60	None	54
9	126%	103	65	None	75
10	95%	126	74	None	7
11	118%	126	86	None	5

CHART IV
TOXIC—BEFORE DELIVERY

CASE NO.	RENAL CAPACITY	BLOOD PRESSURE		ALBUMIN GMS. PER 24 HRS.	TIME BEFORE DELIVERY DAYS
		SYSTOLIC	DIASTOLIC		
12	31%	155	115	15.3	7
13	66%	190		Much	15
13	74%	150	102	9.8	21
14	74%	180	105	0.1	30
15	76%	147	102	Much	1
16	88%	185	105	6.2	1
17	105%	156	98	1.0	20

ception of the first patient whose ratio might have been somewhat higher had larger volumes of urine been obtained. The amount of reduction in kidney function is variable and does not bear any close relation to the severity of the subjective symptoms. The most striking fact is that in these cases the reduction in the amount of effective tissue was not of such a degree as to be of serious and immediate clinical importance. The ratio would have to be reduced to 15 per cent or less of the normal before the renal condition could be regarded as in itself of immediate danger to the life of the patient. Though these observations are very few in number, there are data derived from other cases which support the idea that the conclusion we have drawn as to freedom from immediate danger of renal decompensation may have a general application. In our experience, a very marked reduction in effective renal tissue is always accompanied by the production of a pale, watery, dilute urine. In contradistinction to this, it is a well-known fact that in pre-eclamptic states or in eclampsia itself the urine is of a deep orange color. In such urine we have found high concentrations of urea. The color of the urine may, therefore, be taken as an indication of a retention of the capacity of the kidney to concentrate urea to a high degree, a circumstance which we believe is sufficient in itself to absolve the kidney from direct responsibility for the marked oliguria or even anuria which some-

times occurs. In these cases the cause of the failure to secrete urine is in the main extrarenal. There are apparently rare cases in which there is a widespread necrosis of the renal cortex,³ but in the great majority the renal lesion is not of primary importance.

We believe the figures we have obtained justify us in emphasizing the point that the treatment of the toxemia of late pregnancy should be directed not to the relief of a supposed renal insufficiency, but to the removal of the cause of the toxemia. Therefore, if such measures as sweating and the giving of intravenous injections of alkaline solutions are indicated, it must be on the ground that they diminish the general toxemia and not that they are necessary because renal function is so depressed that the patient's life is on that account in danger.

In Chart V we have arranged observations made at varying intervals of time after delivery on patients who, during the latter months of their pregnancy, had suffered from severe toxemia.

CHART V
PREVIOUSLY TOXIC—AFTER DELIVERY

CASE NO.	RENAL CAPACITY	BLOOD PRESSURE		ALBUMIN GMS. PER 24 HRS.	TIME AFTER DELIVERY DAYS
		SYSTOLIC	DIASTOLIC		
18	48%			0.5	40
12	49%			3.1	18
19	61%	170	108	>1.0	1460
20	62%	187	118	0.2	13
21	69%	120	75	<1.0	19
22	70%	125	95	>1.0	42
23	73%	108	86	<1.0	5
24	74%	150	78	4.6	8
13	81%	140		11.6	83
26	94%	138	90	<1.0	2
27	103%	144	88	None	114
28	107%	110	70	None	1885
17	122%	130	90	>1.0	613

The definitely lowered functional capacity found in eight of these twelve patients came as a surprise to us because, in consonance with the view which is generally held, we had expected to find a rapid and complete return to normal. It will probably occur, however, to most of the members of the Society that there may be an obvious explanation for this continued depression of function. Where it cannot be accounted for, as in Cases 22, 23 and 24, on the ground that the time for repair was too short, it will be assumed that we were dealing with patients in whom there was a pre-existent renal lesion, probably aggravated by the pregnancy toxemia, but in its origin independent of it, and therefore continuing its course after delivery. This is the assumption which is usually made when it is found that albuminuria continues for weeks, months, or years after all other evidences of toxemia have disappeared. But in the cases shown in this chart another explanation must be found. Our principal reason for this belief

is based upon work on the quantitative and qualitative characteristics of the urinary sediment in various types of renal lesion, which has been in progress for some years in the laboratory of the Medical Department.² The nature of the primary lesion in the kidney, the determination as to whether it is in the main inflammatory, degenerative, or atrophic, is indicated by the nature of the urinary sediment. Now in the cases we are discussing in which this lowered function was observed at considerable periods of time after delivery, the anatomical evidence obtained from the urine, that is, the number of casts and the percentage relationships between the various types of casts and other formed elements in the urine, indicated a continuation of the same lesion which starts *de novo* in uncomplicated pregnancy toxemia. When there is an active inflammatory lesion, the sediment is of an entirely different nature and contains blood casts which are never found in simple pregnancy nephrosis. Again, in any far advanced chronic renal lesion in which there is marked sclerosis, the broad, highly refractile, and dark granular casts indicate at once that the renal lesion is not that which is found either before or soon after delivery in pregnancy toxemia. In the cases cited in Chart V, neither these sedimentary findings nor previous urinary examinations, nor the past history, gave any support to the hypothesis of any renal lesion other than that which developed during the toxemia.

Ratios were obtained on six other patients who had passed through a pregnancy nephrosis. They are excluded from Chart V and are dealt with separately because in three of them there was evidence of a renal lesion independent of that produced in the toxemia, while in the three remaining cases the connection between the toxemia and the renal condition we found was not sufficiently established. Two were cases of glomerular nephritis, one diffuse and the other focal. One was a case of nephrosis of unknown origin not dissimilar from that which develops in eclamptic states, but almost certainly independent of it, since albuminuria had been found before pregnancy. A short summary of these three patients' histories is given at the end of the paper.

The other three cases warrant individual discussion because of the possibility that the advanced chronic renal lesion they all suffered from may have had its origin in an unhealed nephrosis contracted during a pregnancy toxemia.

In the case of Mrs. M., albumin was first found in the urine in the seventh month of her first pregnancy. She was delivered three weeks later. At that time the albumin concentration had increased so markedly that the urine boiled solid. The albuminuria did not clear up, and a few months later the edema which had been present before delivery returned. A year later an opportunity was given for a study of her case. There was marked generalized edema and enormous ascites. Large numbers of very broad, waxy, coarsely granular and refractile casts were found, a

picture typical of advanced renal sclerosis. The ratio was only 5.5 per cent. She died three months later.

In the case of Mrs. C., it is known that there was no albumin in the urine in 1914. It was found during her first pregnancy in 1915. Hypertension was also noted at that time. It is not known whether the albuminuria disappeared after delivery, but it was found again in 1917 and in 1919 in pregnancies which ended in abortion. She was first seen by us in the fourth month of her last pregnancy. The urinary sediment was that of renal sclerosis. The ratio was 2.8 per cent. The patient died after hysterectomy, and the kidneys were noted to be small and cystic at the time of operation. Unfortunately, no postmortem could be obtained.

The third case, that of Mrs. G., was first seen in January, 1921. There was marked hypertension. The urinary sediment contained many broad, waxy, coarsely granular and refractile casts. She stated that she had suffered from periodic severe headache since eclampsia in 1914. The ratio was 24 per cent of the normal. There was a progressive decrease in the ratio until her death in February, 1922. At the postmortem, the kidneys were found to be small and markedly sclerosed. There was no microscopical evidence of a former glomerular nephritis which might have led to a secondary contraction, but there was a pronounced arteriosclerosis of the renal vessels.

As a result of this preliminary study, the view we provisionally take is that the renal lesion in pregnancy toxemia is important not before, but after, delivery. The danger lies not in the extent of the lesion during the acute toxemia, but in the fact that it may fail to heal, and may become a continuing and selfperpetuating disease which either alone or with the help of a complicating arterial disease may ultimately lead to the death of the patient in uremia. We take this view only provisionally, because the number of our observations is small, and the whole question is an extraordinarily complicated and difficult one. It will require serial observations over a period of years on many post-toxic cases; much work on the effect on the kidney of normal pregnancy, both before and after delivery; and observations of the influence of pregnancy on patients with pre-existent renal lesions, before any certainty can be attained. At a later meeting of the Society we hope to bring forward further observations in the attempt to answer the questions we have raised.

CASE REPORTS

Cases 1 to 11 are normal pregnancies, histories not given.

A. Toxic Cases, Before Delivery:

CASE 12: June 6, 1921: Ratio 31 per cent. June 21, 1921: Ratio 49 per cent.

Age, twenty-two years, gravida ii, para 0. First pregnancy, 1920, aborted at six weeks. Second pregnancy, a year later. Entered the hospital with edema, headaches, blood pressure 186/124, and history of a convulsion 24 hours previously. Six months pregnant. On the day following there was 15.3 grams of albumin per 24 hours. The volume of urine after fluid restriction was 18 c.c. per hour (normal average 32 c.c.); when much water was taken the volume was only 54 c.c. per hour (normal average 643 c.c.). First ratio seven days before delivery. Because of the pronounced oliguria this ratio cannot be taken as representative of the total renal

capacity. Eight days after entering the hospital she was delivered by hysterectomy. Baby died because of immaturity. The albuminuria decreased after delivery but on the eighteenth day postpartum there were still 3.1 grams of albumin per 24 hours. The volume of urine was 327 c.c. per hour, sufficient to give a full ratio value, in the second ratio test.

Case 13: April 27, 1921: Ratio 74 per cent. May 3, 1921: Ratio 66 per cent. September 8, 1921: Ratio 81 per cent.

Age thirty-one years, gravida iii, para iii. First pregnancy ten years ago was terminated because of symptoms of toxemia. The albumin persisted for six months following this delivery, but at last entirely disappeared. In the second pregnancy, eight years ago, albumin again was noted in the urine, but again disappeared after delivery. In the twenty-fifth week of the third pregnancy, 1921, she was observed for 24 days during an increasing toxemia. Ratio test made on third day of toxemia. Urine contained 9.8 grams of albumin in 24 hours. On the eighth day second ratio test was made. The albuminuria increased until 23.7 grams of albumin were excreted in 24 hours. The sediment first showed only hyaline casts but epithelial casts in considerable number soon appeared. Hypertension rose to 235/140, accompanied with severe headache and vomiting. She was delivered by cesarean section. Fetus weighed 1 lb. 12 oz.; was alive at birth but died shortly after. The uterus was removed because of many fibroids. Following delivery the headache and vomiting disappeared, but the albuminuria and hypertension persisted, though in lessening degree. After twelve days 7.3 grams of albumin for 24 hours were excreted and the sediment showed many hyaline and a few waxy casts. The epithelial casts had disappeared. Third ratio test made 83 days after delivery. There were still many hyaline casts and 11.6 grams albumin in the 24 hours' urine. Still some hypertension.

CASE 14: September 24, 1921: Ratio 74 per cent.

Age, thirty-nine years, gravida i, para i. In the fifth month of first pregnancy albumin and hypertension appeared. In eighth month the urine contained 0.14 grams of albumin in the 24 hours' urine. There was a small number of hyaline, epithelial, granular and waxy casts, all of normal breadth. No toxic symptoms except hypertension. During the next month, hypertension increased until the systolic pressure was over 200. The albuminuria increased but there was never any large excretion. The largest amount was 0.5 grams for 24 hours. The number of casts, however, steadily increased. Labor was induced at the ninth month. Baby in good condition. Three months later there was no hypertension but the urine still contained a trace of albumin and some hyaline casts.

CASE 15: December 14, 1921: Ratio 76 per cent.

Age, twenty-six years. At eighth month of pregnancy the urine was found to contain a large amount of albumin. Systolic blood pressure 160. Until this time the blood pressure and the urine had been normal. Ratio test twelve days after onset of toxic symptoms. The water excretion was 13 c.c. on restricted fluids and 165 c.c. after increased fluids. There was marked edema present. There are no data as to whether or not albumin disappeared after delivery, which was induced on the day the test was made.

CASE 16: January 18, 1922: Ratio 88 per cent.

Age, thirty-three years, gravida i, para i. At eighth month had headache and edema. Albumin and casts appeared in the urine, followed by a rise in blood pressure. Delivered by cesarean section. Baby in good condition. Appendix removed; showed acute inflammation with pus in the lumen. The day before operation 6.2 grams of albumin was excreted in the 24 hours' urine; hyaline casts present. Ratio

test one day before delivery. With fluid restriction the hourly volume was 32 c.c. and after taking large amounts of water, 512 c.c. A week later there was only a trace of albumin in the urine.

CASE 17: Jan. 31, 1921. Ratio 122 per cent. Jan. 16, 1921: Ratio 105 per cent. Jan. 30, 1922: Ratio 96 per cent.

Age, thirty years, gravida ii, para ii. April 20 1919, first pregnancy. Noticed edema at seventh month. Family doctor noticed albumin for first time a few days before. Blood pressure, 109/120. Eye grounds were normal. Urine contained much albumin and many hyaline casts. Three days later patient had a convulsion; at this time the blood urea was 42 mgs. per 100 c.c. Patient was delivered by cesarean section. Twenty-one days after delivery, blood pressure was normal but there was still a heavy cloud of albumin and hyaline casts in the urine. First ratio test nine months after delivery. A catheterized specimen of urine contained a trace of albumin and a few hyaline casts. Water excretion was normal under restricted and forced fluids. Second ratio test when patient was seven months' pregnant. Has had edema for the past six months; no hypertension, but the pressure is now 160/100 and she has severe headaches. The urine has been free from albumin until this month. Albumin: 1.0 grams per 24 hours. Third ratio test 14 days later, when there was an increase in blood pressure. Urine contained 11 grams albumin for 24 hours; many hyaline casts. February 22, 1922, patient was delivered of a dead syphilitic baby. To this date there had been increasing hypertension and albuminuria. After delivery, hypertension decreased but it is not known whether the albuminuria disappeared or not.

B. Previously Toxic Cases, After Delivery:

CASE 18: September 30, 1921: Ratio 48 per cent.

Age, twenty-five years, gravida i, para i. Had marked edema, moderate hypertension, and much albumin and many casts in the urine in the eighth month. Delivered by cesarean section three weeks later. Baby in good condition. Ratio taken 44 days after delivery. There was 0.5 grams of albumin per 24 hours and casts in the urine, but the blood pressure was normal. The water excretion was normal and there was no evidence in the sediment of glomerular nephritis.

CASE 19: February 19, 1921: Ratio 61 per cent.

Age, thirty-three years. In 1917 when three months pregnant, had edema headaches and albuminuria. At six months became suddenly blind. Two weeks later she was delivered by cesarean section. In 1921 the blood pressure was 170/108. No evidence of hemorrhages in the eyes. Some of the smaller arteries were tortuous. Ratio taken February, 1921. There was a trace of albumin, and hyaline and a few epithelial casts in the urine. With limitation of fluids there were 31 c.c. of urine excreted per hour; with increased fluids there was a maximum volume of 553 c.c. of urine.

CASE 20: February 3, 1921: Ratio 62 per cent.

Age, forty years, gravida iv, para iii. No knowledge of abnormality in first pregnancy. Following her second pregnancy she was blind for five days. Third pregnancy aborted. No evidence available as to the presence of albumin between the second and fourth pregnancies. In thirty-sixth week of fourth pregnancy she developed albuminuria and hypertension. Blood pressure, 270/150, accompanied with vomiting. She was delivered by Poro-cesarean section. Baby in good condition. Ratio test thirteen days after delivery. There was 0.2 gram of albumin in the 24 hours' urine. The volume of urine after fluid restriction was 15 c.c. and after large amounts of water, 585 c.c. The sediment showed only hyaline casts.

CASE 21: April 19, 1920: Ratio 69 per cent.

Age, twenty-seven years, gravida ii, para i. First pregnancy aborted at third month. In eighth month of second pregnancy had slight edema, blood pressure, 176/124, heavy cloud of albumin and hyaline casts in the urine, followed in two days by sudden blindness. Examination of the eye grounds showed nothing abnormal in the retina. Delivered by cesarean section. Baby in good condition. Ratio test nineteen days after delivery. Catheterized urine contained 0.03 grams per 100 c.c. and a few casts. With increased fluids the volume of urine was 532 c.c.

CASE 22: September 16, 1921: Ratio 73 per cent.

Age, seventeen years, gravida ii, para i. Until the thirty-first week there was no hypertension, no edema, and only a trace of albumin was found in the urine. She was delivered ten days before term. On the following day she had two convulsions and there was a light cloud of albumin and a few hyaline casts in the urine. Ratio taken five days after delivery. Maximum volume of urine after increased fluids were given was 583 c.c. per hour. She is now (April, 1922) pregnant for the second time. Blood pressure 136/95 with no signs of toxemia. Labor due October 3, 1922.

CASE 23: August 17, 1920: Ratio 74 per cent.

Age, twenty-four years, gravida i, para i. Urine was normal to seventh month of first pregnancy; blood pressure 125/70. Three weeks later some generalized edema. Blood pressure 160/110. During the next 28 days the systolic blood pressure did not rise above 170 but there was an increasing amount of albumin in the urine and many hyaline casts. Then spontaneous labor occurred. Child was still-born. After delivery the blood pressure did not show any appreciable decrease until after the tenth day and the urine showed a light cloud of albumin, forty-three days later. Ratio taken eight days after delivery. There were 4.6 grams of albumin in 24 hours' urine and many hyaline casts were present.

CASE 24: November 11, 1920: Ratio 94 per cent.

Age, twenty-six years, gravida ii, para ii. Headache, vomiting, edema, hypertension at thirty-ninth week of pregnancy. Spontaneous delivery. Baby in good condition. The ratio was taken two days after delivery.

CASE 25: February 25, 1922: Ratio 103 per cent.

Age, twenty-six years, gravida i, para i. At the thirty-fourth week of pregnancy had edema, with severe headaches, terminating in four convulsions before delivery. Urine contained no albumin to the onset of convulsions. Delivered by cesarean section. Baby in good condition. The day after delivery, there was a heavy cloud of albumin in the urine. The following day there were epithelial casts 4 per cent, granular casts 6 per cent, hyaline casts 90 per cent. Twenty-eight days after labor the urine contained no albumin. Ratio taken 114 days after delivery. The maximum volume per hour was 587 c.c.; with restricted fluids there were 28 c.c. excreted per hour. No albumin and no casts.

CASE 26: January 11, 1922: Ratio 107 per cent.

Age, twenty-four years, gravida vi, para i. In first pregnancy, 1917, labor was induced at eighth month because of albumin and high blood pressure. She was curetted in the second, third, fourth, and fifth pregnancies because of the fear of toxemia. Nov. 21, 1921 she entered her sixth pregnancy. The urine examinations have been negative since the first pregnancy. Ratio test Jan. 11, 1922. After abstention from fluids, two hyaline casts were found; no albumin. The volume of urine per hour was 14 c.c. After taking large amounts of water the volume of urine was 432 c.c. Blood pressure, 120/82. She is now five months pregnant with no signs of toxemia.

C. Cases with Renal Lesions Differing from the Type of Lesion Found in Pregnancy Nephrosis or Originating Apart from Any Pregnancy Toxemia:

Mrs. B., age forty years, gravida iv, para ii. The patient was seen in the seventh month of pregnancy. No albumin or casts were found on a routine urinary examination. The blood pressure was 123/74. A cesarean section was done soon after admission on account of malposition of the uterus, due to a ventral fixation operation. On the day following operation, bronchitis was found which in a few days developed into a definite bronchopneumonia. In a few weeks the signs in the lungs had disappeared, but an infected pelvic hematoma was found. At about this time a urinary examination showed a heavy cloud of albumin and the sediment contained many blood casts and other evidences of an active glomerular nephritis. The lesion was diffuse and progressive, for the blood urea concentration began to rise, the ratio fell below 1, and the patient died in uremia a month after the operation. The microscopical examination of the kidneys showed a diffuse subacute glomerular nephritis.

Mrs. M., age thirty-six years, gravida iii, para ii. She was first pregnant in 1914, but aborted. It is not known whether there was any albuminuria at that time. In 1915 during her second pregnancy albumin was found at the first examination during the sixth month. Edema and headaches developed later and labor was induced two weeks before term. In 1921 she again became pregnant and a month before term labor was induced on account of headaches, edema, hypertension and albuminuria. She was first seen by us six weeks after the termination of this third pregnancy. There was a slight albuminuria (0.48 grams in 24 hours) and at the first examination only hyaline casts were found. The ratio was 70 per cent of the normal, the water excretion was normal and there was no hypertension. Four months later another concentrated twelve hours' urine was obtained by catheter, and on this occasion a simple blood cast was found. This is of course in itself an insufficient ground on which to make a diagnosis of glomerular nephritis, but it is enough to raise the question as to the possibility of a focal inflammatory lesion in the kidney.

Mrs. B., age twenty-two years, gravida, iii, para 0. Six years before there had been occasional swelling of the ankles, and a doctor had told her there was something wrong with the urine. No special treatment was advised, and as the edema disappeared and her health was good, no further urinary examinations were made until two years ago when she consulted a doctor for some temporary ailment. At that time albumin was found in the urine, but the amount is not known. It was enough, however, to lead her physician to advise restriction of protein and salt. Six months later, in 1920, she became pregnant, and at the third month developed hypertension, and edema. Albumin was again found. On this account the pregnancy was terminated. In January and June of 1921 therapeutic abortions were done about the end of the third month because of hypertension, edema, and albuminuria. She was seen in July, 1921, a month after the last abortion. The urine contained 0.23 grams of albumin in 24 hours. The sediment contained hyaline, waxy and epithelial casts in small numbers. The blood pressure was 142/60. Water excretion was normal. The ratio was 74 per cent.

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- (1) *Addis*: Arch. Int. Med., 1922, (in press). Jour. Urol., 1917, i, 263. (2) *Ibid*, Cal. State Jour. Med., March, 1922. (3) *Jardine and Kennedy*: Lancet, London, 1920, ii, 116. (For discussion, see p. 418.)

RETROVERSIONS OF THE UTERUS FOLLOWING DELIVERY*

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I BELIEVE it of interest to present to you a follow-up study that may add somewhat to the scanty data concerning the frequency and meaning of the uterine retrodisplacements that develop after childbirth. It is based on the pelvic condition of 1230 women who were delivered at term in our wards and who were examined thereafter at intervals for a minimum of four months and a maximum of twelve months. There were no known pelvic inflammations in the series. During the period of this investigation, 2037 women were delivered at term in our service. The study, therefore, is based on 60.3 per cent of the total material that was delivered at term.

The fact that we were able to follow but 60 per cent of our obstetric material deserves some consideration, since in another study¹ we followed 90 per cent of 458 operative cases for periods between one and four years. Various factors have been combined to prevent the follow-up of more of the obstetric cases. Thus, nearly 15 per cent of the cases were known to be illegitimate and disappeared immediately after labor. Eight per cent lived out of town and too far away to permit of subsequent returns. A smaller percentage were "chronic poor" who move often and cannot be traced. Nearly 10 per cent, however, could not be induced to return nor persuaded that their pelvic condition following delivery might be a matter for their subsequent concern.

We term as retrodisplacements in this study any retroversion or retroflexion of the second or third degree.

We have tabulated the cases in various manners in an attempt to find

(1), the frequency of retrodisplacements in the year following delivery.

(2), the possible influence of vaginal relaxations, forceps extractions, and parity upon the production of the displacement.

(3), the months when the retrodisplacements were first noted.

(4), the percentage of retrodisplacement cases that developed symptoms.

(5), the month when symptoms first developed.

(6), the result of pessary treatment.

(7), the comparative frequency of subsequent pregnancy in women with retroverted and anteverted uteri.

(8), the anatomic result of operations for retrodisplacements.

1. *The frequency of retrodisplacement of the uterus during the year*

[†]Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

following delivery. There is some literature bearing upon the frequency of retropositions. A number of observers have determined that about 22 per cent of gynecologic cases have retroverted uteri. A few have sought to determine its frequency in women in general. E. Schroeder's report² is the best known of these. He found retropositions in 28.7 per cent of 411 women taken from the Königsberg gynecologic dispensary, the obstetric and medical clinics. A few only have investigated the frequency of posterior uterine displacements following delivery. Winter³ found that they occurred in 12 per cent of 300 women from two to ten months after labor. In marked contrast, we found posterior displacements at some time during the first year following confinement in 41.1 per cent (505 cases) of the 1230 in the series. It seems worthy of comment that retrodisplacements existed in only 19.6 per cent of the 186 private cases which were studied in the series. This small percentage held down the figure for the total series since the frequency in the clinic cases was 44.8 per cent. Since our clinic patients almost without exception were hard working women, and the private patients were of the leisure class, it seemed safe to assume that hard work following delivery increases the frequency of retroversions and retroflexions.

2. *The comparative frequency of vaginal relaxations and forceps deliveries in the retrodisplacement cases and the normal controls, and the influence of parity in the production of the uterine displacements.* The series presented 505 cases with retroverted uteri and 725 normal controls. Vaginal relaxations sufficiently marked to warrant repair appear to have little influence on the production of the displacements since they were found in only 29 per cent of 505 retrodisplacement cases in contrast with 24 per cent of the 725 cases used for control. We then grouped together all the cases with vaginal relaxations and divided them into two classes, accordingly as the uterus was retrodisplaced or in the normal position. There was extremely little difference between the percentages of the two groups. The cases of relaxed vaginal outlets with retroposed uteri constituted only 46 per cent of the total in contrast to the relaxed vaginal outlets with normal uterine positions which comprised 54 per cent of this series.

We have reviewed the forceps series hoping to determine to what extent lacerations from instrumental deliveries were responsible for the displacements. Nine and six-tenths per cent of the 1230 cases were delivered at some time by forceps. Forceps were used in the labors of 10.3 per cent of the 505 retroposition cases and in 9 per cent of the 725 normal controls. In a preliminary study based on a total series of 761 cases, the percentages were 9 per cent and 5.7 per cent respectively. There were very few high forceps and comparatively few midforceps. An unusual number of low forceps for uterine inertia

brought up the percentage. Yet it does not seem as if forceps could have been of much etiologic moment since there were only 119 applications in the 1230 cases and there were 505 retroflexions for which we seek the etiology.

We attempted to ascertain whether a larger proportion of the retrodisplacements had had difficult first labors but abandoned the study because of difficulties in making comparison.

Grouping our cases as the uterus was forward or back, we arranged them according to the number of children they had borne. Our suspicion that a woman was more likely to develop retrodisplacement after many labors than with a few does not seem to be borne out in Table I. The most striking point developed from the compilation was that there were more women who had extremely large families in the normal group than in the retrodisplacement cases. Thus, there were 20 women in the 725 normal controls who had had from nine to fourteen children, in spite of which the uterus remained upright during a minimum observation of six months following labor. On the contrary, there were only two of the 505 retrodisplacement cases who had had as many as nine children.

TABLE I
PARITY AND DISPLACEMENT

UTERUS RETROPOSED 505 CASES		UTERUS NORMAL 725 CASES
	per cent	per cent
Para I	43.9	44
Para I and II	65.6	63.4
Para I-III incl.	78.2	76.7
Para I-IV incl.	87.5	83.2
Para I-V incl.	93.2	90.1
Para I-VI incl.	96.9	94.7
Para I-IX incl.	100	100

3. *Month when the uterus was found displaced.* (Series of 505 cases.)—Our postpartum cases are urged to return for observation six weeks, three months, six, nine and twelve months after delivery. Not all reported absolutely on this schedule, although the majority did so. When they did not return during the week they were due, they were summoned by another letter, and if this failed, a nurse was sent to bring

TABLE II
MONTHS FOLLOWING DELIVERY WHEN DISPLACEMENT WAS NOTED

505 CASES	
First Month	28 per cent
Second Month	26.5 per cent
Third Month	12.5 per cent
Fourth Month	9 per cent
Fifth to Eighth Month	18 per cent
Eighth to Twelfth Month	6 per cent

them in. This delay made many visits later than schedule. Seventy-six per cent of the 505 cases were found to have uterine displacements within four months after delivery; 18 per cent developed displacements during the second four months; and 6 per cent during the last four months of the year.

4. *The percentage of symptoms in retropositions and in the normal control cases.* (Series of 1230 cases).—Great interest centers about the frequency of pelvic symptoms in the retroposition cases in comparison with those in the controls. This phase of the subject has been considered by several investigators. Winter's series of 300 cases presented 36 cases which had displacements two to ten months following labor. Eleven of these had no pelvic symptoms. Of the 25 remaining cases of the series, Winter concluded that only four had symptoms which were due to the displacement. Seeking to determine the relation between uterine displacements and symptoms, he examined 710 women who appeared normal. Twenty-two per cent (154 cases) had posterior displacements, 60 per cent of which gave no pelvic symptoms. E. Schroeder subsequently continued this investigation. His material comprised 411 cases, 82 of which were from the gynecologic polyclinic, 84 from the obstetric and 145 from the medical clinic. Posterior displacements were found in 28.7 per cent of this number. Schroeder states that 73 per cent (303 cases) of the total had no pelvic symptoms, yet 26 per cent (79 cases) of these had retroversions. There were 108 women who complained of lower abdominal symptoms, 36 per cent (39 cases) of which had displacements. Schroeder, therefore, concluded that 25 per cent of women who complain of no symptoms referable to their pelvis have retroversion. This investigation is the basis of the school which believes that uterine displacements are usually of little importance.

In our study we have classed bearing-down sensations, or a feeling of pressure in the pelvis, or sacral backache as pelvic symptoms. While agreeing with the view which holds that these symptoms may well develop from pathology associated with the uterine displacements rather than from the retroposition itself, we submit that it is of interest that they were three times as frequent in the retroposition cases as in the normal controls in our series. Thirty-two per cent of the 505 retroversions came in because of symptoms, as did ten and a half per cent of the 725 normal controls. The remainder of the two groups were brought back purely because of the urgency of the follow-up. Our study forces the belief that nearly all of the differences between these two percentages is due to the sequelae of retroposition, as it is likely that faulty posture and bad feet are equally common in both the major groupings of our study. Vaginal relaxations were present in approximately the same percentage in each series, 29 per cent of 505

retroversions (146 cases), and 24 per cent of the 725 normal controls (174 cases). We also attempted to see to what extent the symptoms depended upon vaginal relaxations. There were 162 of the 505 retroversion cases who came in because of symptoms. In this series of 505 cases, there were 146 vaginal relaxations. There were 76 of the 725 normal controls who came in because of symptoms. Yet there were 174 vaginal relaxations in the 725 normal controls.

5. *The month in which symptoms developed.*—This section throws much sidelight on the previous grouping. There were 161 of the retroversion group that complained of pelvic symptoms. Arranging our cases to show the time of the appearance of symptoms, we found pelvic symptoms developed in 50 per cent of the 161 cases in the first three months; 25 per cent in the second quarter; 15 per cent in the third; and 10 per cent in the fourth quarter.

TABLE III
161 CASES RETRODISPLACEMENT PRESENTING SYMPTOMS

MONTH APPEARANCE OF SYMPTOMS	
I	20 per cent
II	20 per cent
III	10—50 per cent
IV to VII	25 per cent
VII to X	15 per cent
X to XII incl.	10 per cent

6. *Pessary treatment.*—We attempted to correct the displacement in all cases. The great majority were straightened without anesthesia. All subinvolution cases were treated with douches and tampons. The entire series were advised to use the knee-chest position and the kangaroo walk. No attempt was made to manually correct the displacement until at least five weeks had elapsed after delivery. The position was corrected then and pessaries were placed in 281 cases, all of which were subsequently followed. The position was not corrected in the remainder of the series, either because the uterus could not be brought forward without gas anesthesia, for which the patient failed to return, or because the vagina was too relaxed to hold a pessary. Pessaries did not hold in 47 of the 281 cases. The patient refused to wear them in 32 instances. Orthopedic cures were obtained in the remainder (72 per cent) so that the uterus remained forward after the removal of the pessary. Operation was advised in the 47 cases that the pessary did not hold. Twenty-one of these subsequently came to the various repair operations.

There were 161 cases of retroversion which presented symptoms sometime during the first year after labor (32 per cent of the 505 retroversions). Sufficient time has not elapsed to permit final judgment as to the result in 14 cases. The symptoms disappeared following the

correction of the deformity by pessary in 68 per cent of the remaining 147 cases and this has continued following removal of the support. The symptomatic cure by pessary treatment, therefore, is 68 per cent. Partial symptomatic cure was obtained in 15 per cent. This treatment failed in 17 per cent and operation was advised in this group.

7. *Relative fecundity.*—It is extremely difficult to draw conclusions from a statistical study as to the relative fecundity of the various groups of a series unless the tables contain many thousands of cases. Hoping to reduce error, we have studied only the 761 married women who formed an earlier series, and who have been observed for a minimum of two years. Pregnancies were observed in 15 per cent (65 cases) of 430 women who did not have displacements. There were only 10 per cent (32 cases) of pregnancies in women who had had posterior uterine positions but who had been treated by correction of the displacement and pessary support. Six women whose uterine displacements had not been satisfactorily corrected returned pregnant. There were only 119 cases in this group, giving an incidence of pregnancy of 5 per cent. One case came back with an early pregnant uterus prolapsed over the pessary and two others had early pregnancy in a retroverted uterus, although that organ had been up in place when the patient was last seen.

8. *Anatomical result of operation.*—During the period of this investigation, we have performed 191 uterine suspensions in women whose symptoms were of several years' duration with the exception of the few cases considered in the above study. All of the cases were so-called simple suspensions, that is, no case presented definite inflammatory disease, although there were many cases with mildly diseased ovaries. The majority needed vaginal repairs which was done when necessary. The appendix was removed in nearly all cases. We have thought it worth while to report the subsequent anatomic studies of the pelvic condition. There were no deaths in the series. Two of the cases were lost for the purpose of study. The remainder were followed for a minimum of six months and a maximum of three years. A study of this type seems advisable since more than 130 retrodisplacement operations have been described which are all advocated as the very best procedure.

One hundred and eight Webster operations were performed with two recurrences. The return in one was found four months after operation. She became pregnant one year after discharge from the hospital. The recurrence was not complete in the other case, although the uterus sags unless she wears a pessary. Thirty-one Coffey operations were performed without recurrence. The twenty-eight Kelly-Neel operations were followed by four recurrences, three of which were subsequently operated, and one was treated by pessary. Atypical Ferguson operations were done in five cases, as were sixteen atypical operations in which a new fundal insertion was made of the round ligament. There

was no recurrence in this group. The subjective results for the series will appear in another paper.

Six recurrences in a series of 189 cases (3.3 per cent) seems very high when broad serous surfaces were approximated and were held together by nonabsorbable sutures in all cases. The three recurrences in the Kelly-Neel group which were subsequently reoperated gave constant anatomic findings. Careful notes of the pelvic condition had been made at time of operation in each of the 191 cases.

As a result of our study, we feel that we may adduce conclusions to account for the failures.

The round ligament operations now performed fall in three great classes, viz., (1), those which shorten and refix the round ligament in the inguinal canal, including the Alexander procedure and its modifications; (2), those which elevate the uterus by a new fixation of the round ligament in the abdominal wall, as the Olshausen and the Gilliam suspensions and their modifications; (3), those in which a new attachment of the ligament is made on the fundus of the uterus, as in the Coffey, Webster, and the atypical operations of our series.

The round ligament was not designed by Nature to hold the uterus forward, except possibly in pregnancy. Yet it may be made to do so when it is shortened sufficiently, provided the insertion in the inguinal canal is firm and the uterine origin is in its normal elevated position. While interested in this subject, we have been surprised to find how frequent are abnormal attachments of this ligament. Thus, the uterine insertion of the round ligament often loses its high fundal attachment and slips down in long standing retroversions even as far as the peritoneal reflection of the bladder. In such cases, the uterine end of the ligament may be spread out like the blades of a fan (Fig. 1). Traction on the distal end of such a round ligament will not pull the fundus over in flexion, because the ligament is really attached to the midpoint of the entire organ, i. e., uterus and cervix taken as a whole. Such a pull is far more likely to bring the uterus forward in the old retroposed position with the cervix anterior to the level of the fundus and pulled up close to the symphysis. We have also been impressed by the number of lax inguinal rings in which there are weak and yielding attachments of the round ligament. It naturally follows if the fixation point in the groin is not firm, that any round ligament operation of groups one and three will fail.

Our experience has shown that the uterosacral operation as usually performed through the abdomen merely shortens the peritoneal fold and does not reach the strong part of the ligament. The strong part of the uterosacral as seen from an incision in the abdomen is close to the uterus. The superficial part of the ligament has no firm fixation on the sacral side and if put on a stretch will show a pull scattered out

on the peritoneum even as far as the mesentery. Few abdominal operations utilize the deeper portion of the ligament since hemorrhage is likely to occur during the procedure. We have opened seven cases in which others had performed unsuccessfully the ordinary abdominal shorten-

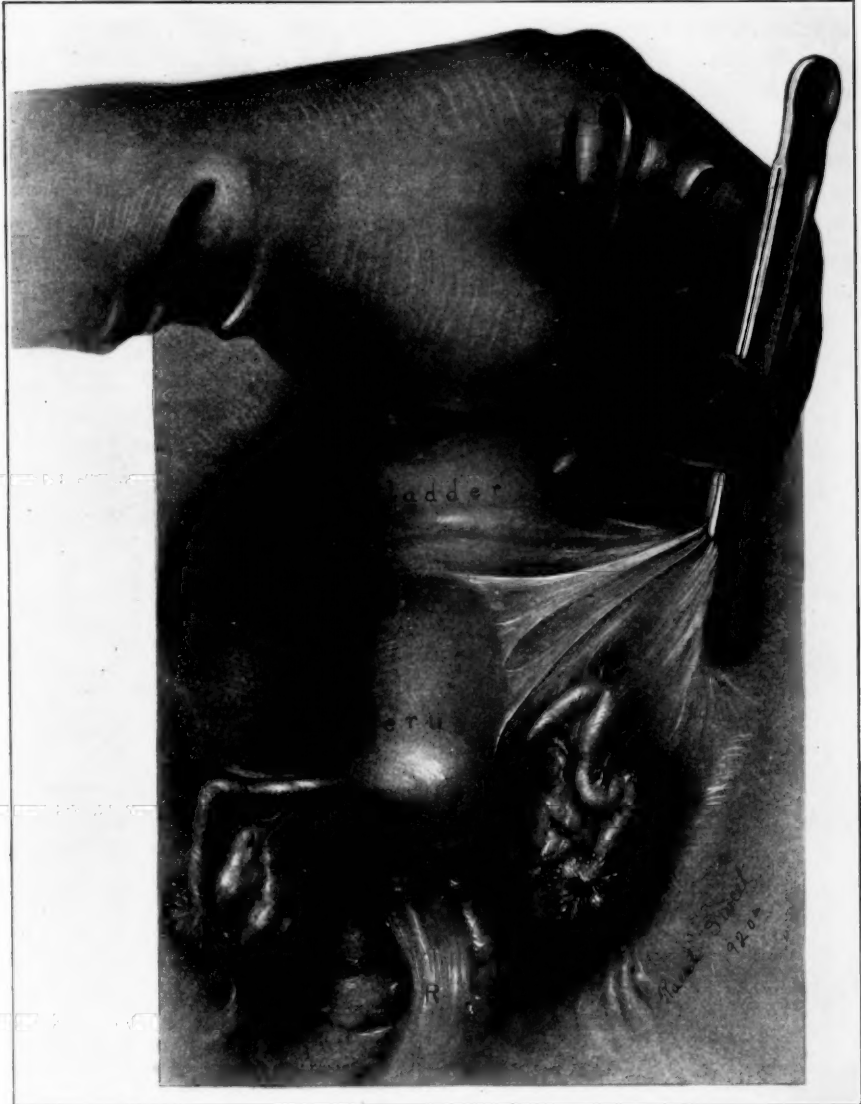


Fig. 1.—Showing atrophy of uterine end of round ligament and that forward traction no longer elevates the fundus.

ing of the uterosacrals. Three were the recurrences in the Kelly-Neel operation in this series. In each case, the nonabsorbable sutures were found high up on the cervix and shrouded in filmy adhesions. There was no vestige of a new ligament.

There is no doubt that the two recurrences which followed the 108 Webster operations resulted because the weakened attachment of the ligament in the inguinal ring was not properly appreciated in the examination during the operation. At any rate, this attachment was not strengthened at the time by suturing. If the fixations of the ligament are firm, even a weak round ligament will maintain the position. The good results which have been obtained by Kelly suspensions show that very little restraining force is necessary to keep the uterus forward if that organ is in the forward position. It would appear, on the contrary, that the four recurrences in the 28 Kelly-Neel operations resulted because the fundal insertion of the round ligament had slid down from its previously high origin and for that reason, the operation had not been well chosen. The cases were all done by one operator, who also shortened the uterosacrals in the routine of the operation.

It follows, therefore, that the surgeon should carefully consider both the groin and uterine attachments of the round ligament before determining upon the type of his operation. He may find it necessary to advance the uterine origin as well as to strengthen the insertion in the canal, a procedure which we have taught for several years.

The behavior of the ovaries following the various suspensions has been a matter of some concern. Ovaries in long standing retroflexions commonly develop symptoms. Many men, forgetting this point state that ovaries are more apt to give trouble after certain types of operation. Our records show that one or both ovaries were enlarged and tender in 11 of the 108 Webster operations; in five of the 28 Coffey; in eight of the 27 Kelly-Neel; and in four of the 20 Ferguson and atypical cases. None required subsequent operation.

We cannot properly discuss the question of pregnancy following operations since only 15 women in the 189 have yet become pregnant. Their pregnancies total 19. Two women were aborted because they became pregnant immediately following operation. They have since borne children. There was one pregnancy in the Coffey group, eleven in the Webster, and four in the Kelly-Neel, one of which miscarried. Two women in the Webster group have had two children each, since operation. There were no dystocias in the series and there has been no recurrence of the displacement.

The grossly apparent errors of the work are that we have not followed 100 per cent of the cases, nor observed all of the series for an equal length of time; moreover, we are ignorant of the pelvic condition prior to the first pregnancy. Yet we believe that we may reasonably present the following conclusions:

1. Retrodisplacements were noted in 41.1 per cent of 1230 cases which were accurately followed between four and twelve months after delivery.
2. Thirty-two per cent of the 505 retropositions came back because

of pelvic symptoms. Ten and a half per cent of 725 controls with upright uteri complained of slight symptoms.

3. Nineteen and six-tenths per cent of 186 private cases presented retropositions in contrast to 44.8 per cent found in 1044 clinic cases. Hard work may, therefore, be an important etiologic factor in retrodisplacements.

4. Replacement of the uterus and pessary support gave anatomic correction in 72 per cent of the cases which wore pessaries. Symptomatic cure and anatomic correction were obtained by identical procedures in 68 per cent of the 161 cases presenting symptoms.

5. Subsequent pregnancies were observed in 15 per cent of a portion of the series in women who did not have displacements, in 10 per cent of women who had treated retropositions, and in five per cent of cases whose retroposition had not been corrected.

6. No one type of suspension has been entirely successful in our hands. There were two recurrences in 155 operations which made a new round ligament fixation upon the uterine fundus necessary (108 Webster, 31 Coffey, 16 atypical). There were four recurrences following 28 Kelly-Neel suspensions, together with the shortening of the upper part of the uterosacral ligaments.

7. The need of early correction of retropositions following labor is clearly evident.

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CLINICAL AND EMBRYOLOGIC REPORT OF AN EXTREMELY
EARLY TUBAL PREGNANCY; TOGETHER WITH A
STUDY OF DECIDUAL REACTION, INTRA-
UTERINE AND ECTOPIC

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(Continued from September issue, p. 227.)

II

A STUDY OF DECIDUAL REACTION, INTRAUTERINE AND ECTOPIC

PROMPTLY following the fertilization of the ovum there develops in the maternal body a peculiar phenomenon which has been termed the "decidual reaction." With the rapid progress that is being made in the sum of knowledge concerning human placentation and the orientation of the ovum the views on the formation of the decidua have undergone a notable change. We know now that while this reaction is designed to be preeminently an intrauterine phenomenon, it is by no means limited to this region, even in normal gestation. In order to perfect the study of the interesting case of early tubal pregnancy which is here recorded, I have carefully compiled and classified the various published contributions on the decidual phenomena of pregnancy, and here present a systematic résumé of the facts and theories pertaining to normal and ectopic decidual reaction as recognized today.

THE EARLY ENDOMETRIAL CHANGES OF NORMAL PREGNANCY

Fertilization occurs at the favorite resting-place of the spermatozoa—the upper, outer portion of the fallopian tube. Although it is probable that the decidual reaction begins in the uterus imperceptibly shortly after conception and long before the appearance of placental tissue, it is not until about the third week that the changes become distinct. They are then most marked at the site of ovular attachment, although occurring to a varying degree in the entire uterine mucosa. Taussig remarks that, independent of the location of the pregnancy, the uterus is the seat of the most extensive decidua formation, the tissue appearing as a definite layer as distinguished from the discrete patches of decidua elsewhere in the body.

There are five distinctive features of the new-formed tissue, as Johnstone has indicated, namely, "a transformation of the embryonic connective-tissue corpuscles of the stroma into the large decidual

cells"; an increase in the number of the glands and a greater tortuosity in their course; a marked thickening of the endometrium, which becomes corrugated superficially; a varying degree of edema of the stroma; and a congestion of the blood vessels. The structure thus produced is termed the *decidua*. It presents two clearly defined layers—an upper compact surface (*stratum compactum*), in which are found the decidual cells and the ducts of the glands; and a lower spongy layer (*stratum spongiosum*), containing only a few decidual cells, the blood vessels and the dilated glands forming cavities. The differentiation of the decidual layers is due to this glandular hyperplasia. The point of pronounced decidual reaction immediately beneath the implanted ovum is termed the "basal decidua" (*decidua basalis*), and that portion which pouts up and surrounds or even covers the ovum, the "capsular decidua" (*decidua capsularis*, of His) or *decidua reflexa*. The remainder of the structure covering the entire uterine cavity is the "true decidua" (*decidua vera*).

It is now generally conceded that the intrauterine decidual reaction commences, or, at least, becomes evident, when the ovum begins to invade the endometrium. Its rapidity of development varies greatly according to the peculiarities of the individual. As yet it has not been determined whether the reaction precedes or follows the ovular implantation. It is known, however, that the younger the ovum the less pronounced is the reaction. Thus, such ova as Jung's and Peters' show practically no decidual formation other than a few cells which closely surround the ovum. Also, most of the well-known early ova do not show the two decidual layers save indistinctly; in the Heine-Hofbauer ovum they are entirely absent.

The Decidual Cell.—The main characteristic feature of the decidual reaction is the appearance of a peculiar cell which has its origin in the loose connective tissue of the uterine mucosa. In size this cell greatly exceeds that of the cell of the interglandular substance of the mucosa, and in shape it is very irregular. When fully developed it closely resembles the epithelioid cell of tuberculosis, the lutein cell of the yellow body of the ovary, and the large round cell of sarcoma. Because of this varied resemblance to normal and pathologic cells it has been termed by Ruge "the physiologic type of this pathologic [sarcomatous] unit."

The decidual cells are large, beautifully clear, with a delicate protoplasm containing round nuclei which stain deeply (*Pfannenstiel*); they vary in shape, being round, oval, polygonal or spindle-like (*Taussig*); and in size they range from 20 to 50 microns in diameter. In the compacta they are closely grouped and interspersed with smaller cells of a polygonal shape, which Marchand regards as the decidual cells in the earliest stage of development. In the spongiosa they are more widely separated, lymph-channels together with a few

leucocytes lying between them. Fibrillar prolongations connect the decidual cells in this region, the prolongations passing through the intercellular substance.

Hirschberg mentions as the most striking characteristics of the decidual cell: Its unusual size; its variation in shape; and the peculiar staining properties of its protoplasm. It is never found save in pregnancy; and it first develops around the arterial capillaries of the endometrium, which would seem to indicate that the stimulation to the decidual reaction is borne by the blood-current.

The Decidual Stroma.—A decided passive or venous hyperemia of the endometrium, which has been particularly noted by Jung (1908), is characteristic of the entire decidua. All the blood vessels are in a stage of congestion, and this, doubtless, is the explanation of the edematous condition of the decidual stroma which has been marked in all early ova.

The Endometrial Glands.—Some histologists regard the presence of papillary epithelial projections into the lumina of the glands as a characteristic feature of the early decidua. Johnstone, while speaking of the endometrial glands, remarks that "Bryce and Teacher suggest that the glands are more resistant to the destructive action of the trophoderm than the other tissues, although they ultimately suffer some dissolution. Frassi (1907) has shown conclusively that the glands may be opened into laterally, and it is probable that this may be effected either by the eroding action of the trophodermic buds, or by the digestive action of the proteolytic ferments of the trophoderm while that tissue is at some little distance. This is presumably the explanation of three observed facts—firstly, the presence of epithelial 'rests' in the 'border zone,' formerly, but probably erroneously regarded as relics of the superficial epithelium; secondly, the opening of glands into the intervillous spaces, observed by Frassi (1907) and Fetzer (1910)—the glands as they run up towards the equatorial portion of the decidua capsularis being opened into laterally; and thirdly, as a consequence of this, the presence of blood in the gland-spaces, which has been noted by Siegenbeek van Heukelom (1898), Leopold (1906) and Fetzer amongst others."

Cervical Decidua.—Generally the decidual reaction is confined to the corporeal endometrium, ending at or above the internal os. It has, however, occasionally been noted, in the form of irregular patches of decidual cells, in the cervical mucosa, such cases having been recorded by Carl Fisch, Hohmeier (1905), Waldstein (1900), Blumberg (1905), von Franqué (1897) and Volk (1903), notwithstanding Gebhart's assertion that a true cervical decidua is never found.

Most of the cases of cervical decidua have been noted in association with the various forms of placenta prævia or with a low lateral implantation of the placenta in the upper part of the lower uterine seg-

ment. In the cases of central or complete placenta prævia, such as are recorded by Ponfick (1899), Weiss, and Keilmann (1897), the cervical decidua was very marked. Some authorities, notably Blumberg, believe that a cervical decidua is always present in placenta prævia and should be regarded as a diagnostic feature of this obstetric accident. The association of a cervical decidua with a low placental site is the strongest argument that can be adduced in support of Pozzi and Caseaux's theory that "the intensity of decidual reaction in the uterus is dependent on the proximity of the ovum." This theory fails, however, in the light of the more recent knowledge of the subject. Muscular hypertrophy only, as Taussig has indicated, bears a direct relationship to ovular proximity.

THE CAUSATION OF THE DECIDUAL REACTION

A natural inquiry arises as to the cause of this curious change in the uterine mucosa during early gestation. Biologists have accepted two theories as plausible; they have, moreover, come to the conclusion that these etiologic factors are cooperative, although which is the more potent is not as yet determined. The theories are as follows:

a. *The Chemical or Hormone Theory of Loeb.*—This implies some obscure biochemical influence originating after the fertilization of the ovum, and springing either from the ovum itself or, more probably, from the corpus luteum of the ovary.

In 1898, the yellow body of the ovary was recognized by Prentiss as a very important member of the group of so-called ductless glands, playing, as O'Donoghue (1911) states, "a part in the chemical coordination of the body." It is more than a mere scar. It has a distinct glandular structure, and its characteristic lutein-cells are those of a typical secretory gland, being epithelioid both in their origin and nature. The body appears within a few days after fertilization; steadily develops in size and activity through the first half of gestation; and then, having accomplished its purpose, gradually fades away to become the white fibrous scar known as the *corpus albicans* which, through leucocytic phagocytosis is eventually absorbed. Like the other ductless glands it possesses a very rich blood-supply which especially reaches the active lutein-cells, whose lipoid secretion thereby directly enters the blood-current. This vascularity of the corpus luteum persists even to full term, and the organ during the first half of pregnancy shows abundant evidences of colloid (Bartelmez).

The Functions of the Corpus Luteum.—It is now definitely known that these functions are at least three in number:—*Primarily*, the corpus luteum plays a most important rôle in the process of ovular implantation and early embryonic development; *secondarily*, it stimulates mammary development; or, as O'Donoghue remarks, while "no

definite evidence has been adduced to show that the corpora lutea produce a specific secretion which when poured into the blood-stream directly influences the mammary glands, the presumptive evidence is strongly in favor of such a direct chemical stimulus;" this inter-relationship is proved by the associated growth of the mammae at puberty (when ovulation is established), in menstruation and pregnancy, and in the presence of certain ovarian tumors; also by the associated mammary atrophy at the time of the disappearance of the corpus luteum and in connection with the destruction or removal of the ovarian tissues; *thirdly*, as Beard indicated in 1897, the corpora lutea retard ovulation during pregnancy to a limited extent.

To Gustav Born belongs the distinction of conclusively establishing the existence of the obscure internal secretion of the corpus luteum which stimulates the remarkable change now known as the "decidual reaction," and the loss of which in the first trimester of pregnancy—as by ovariectomy—so profoundly alters embryonic development as to inevitably result in abortion. Without the presence of the corpus luteum the endometrial changes of early pregnancy fail to develop, the uterine mucosa not being sensitized by the occult influence of the hormone secreted by the lutein-cells.

b. *The Mechanical or Irritative Theory.*—Certain physiologists claim that the decidual growth is induced by a direct mechanical irritation or stimulation of the endometrium by the impregnated ovum. Loeb (1909) has shown that any unusual mechanical interference will answer, the ovum not being an essential factor in the process. The interesting question of the orientation of the ovum is thus brought up, together with the peculiar processes by which this localization is accomplished. Much light has been thrown upon this obscure matter by the labors of the biologists who have noted the curious fact that in certain animals—notably the guinea-pig and the mouse—the decidual reaction begins to appear only after the developing ovum has corroded the superficial epithelial layers of the endometrium.

The Trophoblast and Its Destructive Property.—The phenomenon of the orientation of the ovum has been concisely presented by Minot (1904) in the following manner: "The human ovum produces upon its exterior surface during its earliest stages of development a thick layer of cells known as the *trophoblast*. The function of the trophoblast is to corrode away a portion of the mucous membrane of the uterus, making a cavity in which the ovum lodges." This work accomplished, the trophoblast undergoes a hypertrophic degeneration, "such as to produce a series of irregular spaces which persist and become the intervillous spaces of the placenta. Papillary outgrowths of the chorionic mesoderm meanwhile penetrate the trophoblast,

initiating the formation of the chorionic villi. The trophoblastic cells covering each of these mesodermic outgrowths persist in two layers—the inner, cellular in nature (*Langhans' layer*), and the outer, the *syncytium*. These two layers represent the first stage of the villous ectoderm."

Herzog (1909), of Chicago, emphasized the fact that the trophoblastic cells are not phagocytic in the ordinary sense of the word; and he offered the suggestion that the destructive property of the trophoblast lies in an enzyme secreted by its cells, which enzyme "diffuses into the surrounding maternal tissues and causes coagulation-necrosis and complete degeneration of cells." Thereby is formed the *Nitabuch fibrinoid stria* lying on the surface of the decidua next to the chorion and produced apparently by the syneutial layer of the chorion. Herzog remarked that this destructive action of the trophoblast "is the exact picture of malignant tumor-proliferation, while the reaction of the maternal tissue reminds one of a profound destructive hemorrhagic inflammation." The arrest of the trophoblastic corrosion results from the establishment of a temporary immunity of the maternal tissues to the hormonal action, or is due to a suppression of the trophoblastic secretion at the close of the first trimester of pregnancy.

Both Etiologic Factors Co-active.—It is now generally accepted that both the chemical and the mechanical factors of decidual stimulation are operative, neither being effective in the absence of the other. Outerbridge (1912) has clearly expressed this belief as follows: "Loeb's interesting experiments have shown—at least for rabbits and guinea-pigs—that the primary factor in the formation of uterine decidua is the presence in the circulating body-fluids of a hormone developed in the corpora lutea; that the uterine mucosa, being sensitized by the presence of this substance, will respond by the formation of a decidua to any nonspecific irritation—such as deep incisions into the uterine wall, the introduction of bits of glass-tubing or other foreign substances into the uterine cavity—even though the ovum be entirely excluded from entrance into the uterus by ligation of both tubes. If this theory, that the sensitizing influence arises in the ovary, and not in the developing ovum, is correct, the seat of the fetal attachment would appear to exert no influence whatever on the formation of decidual cells except by acting as a mere mechanical irritation to the fixed connective-tissue cells of that region. Just how far this theory applies to the formation of extrauterine decidua cannot be stated. Loeb has not been able to produce decidua outside the uterus, but the practically physiologic development of decidua nodules in the peritoneum and ovaries in normal pregnancies would seem to indicate that it may, in part at least, hold true for these situations as well. If the sensitizing hormone is the essential factor, and this

arises in the corpus luteum, it would be natural to expect to find the ovarian stroma, at least that of the ovary containing the corpus luteum and upon which its secretion must work in its fullest concentration, the seat of extensive decidual change. The fact that this change has been comparatively seldom observed in the omentum * * * would seem to indicate that under ordinary circumstances that organ either does not come extensively under the influence of the ovarian hormone, or that if it does come under this influence mechanical stimuli are wanting to call forth a decidual reaction."

THE PROTECTIVE FUNCTION OF THE DECIDUA

These facts having been determined, as far as the limited knowledge of the subject will permit, it is logical to inquire as to why the decidual reaction is necessary in pregnancy, normal or otherwise. Johnstone (1914) states that it was Sir William Turner who first promulgated the view that the reaction is protective of the maternal tissues, the formation of the decidual cells always being accompanied by a leucocytic infiltration of the tissues in which they appear, as Meyer (1911) has demonstrated. This would seem to indicate a *quasi-inflammatory* reaction designed to limit the invasion of the maternal tissues by the chemico-mechanical stimulus. Murray (1913) expresses this view clearly when he says that there is "the most complete evidence that a normally pregnant animal is actively protecting itself from something injurious in its own placenta." This antagonistic element in the maternal fluids is proved by the fact that "any excursions of syneytial cells into the blood-stream is met with the death and disintegration of those cells" (Foulkrod, 1913). Closely associated with this theory, obviously, is the fetal or placental theory of the etiology of the pernicious vomiting of pregnancy.

Johnstone also claims that "the decidual reaction is in all probability indirectly but equally protective to the embryo, in that, by supporting and strengthening the maternal capillaries, it prevents a too sudden and too extensive opening up of these vessels—the probable consequence of which would be to tear up the delicate attachments of the ovum." The formation of decidua must, accordingly, be regarded as a mutual protection for mother and fetus.

THE DECIDUAL REACTION IN ECTOPIC PREGNANCY

The decidual cast of a tubal pregnancy is a familiar object to the gynecologist; it is an invariable accompaniment of ectopic gestations progressing to two months or more. Such a cast also forms in the unimpregnated horn of a didelphic uterus, as in a case reported by Stevens (1913-14), in which the cast presented the ordinary appearance of that thrown off in an ectopic pregnancy, with the absence of the fetal elements, save that it was larger and bulkier.

Microscopically it was identical with normal decidual tissue, showing the decidual cells, the interglandular cells, and the remains of the uterine glands.

The decidual reaction in ectopic pregnancy presents two distinct phases, namely, the reaction as occurring in the uterine cavity, and that occurring at or near the site of ovular implantation. It may be stated that, as a general rule, in ectopic gestation the decidual formation is more marked away from the ovum than at the place where it lies imbedded (*Taussig*).

a. *The Intrauterine Decidua in Ectopic Pregnancy*.—How early the uterine mucosa shows a change in tubal or other forms of ectopic pregnancy is not definitely known. *Taussig* (1906) states that it is only from the second month that a uterine decidua is found in ectopic pregnancy with any degree of regularity, and that it is but very rarely found in the case of early tubal abortion; while *Johnstone* remarks, "there is no evidence to indicate that the uterine change in such cases occurs before the ovum has imbedded itself in its abnormal situation." He believes, with *Loeb*, that the change results from a biochemical influence consequent upon the invasion of the ovum wherever located, this influence being blood-borne from the trophoderm; and he regards the uterine reaction in tubal pregnancy as "a praiseworthy but misplaced effort on the part of the maternal tissues to counteract the trophodermic influence." This intrauterine reaction is most marked when the pregnancy is situated in the isthmus of the tube.

Sampson (1914) claims that it has begun to appear by the end of the first month and soon after shows the two characteristic layers covering the entire intrauterine area. The *compacta* steadily increases in thickness with the progress of the tubal gestation. In the earlier cases it forms not more than one-fifth of the thickness of the *vera*; but in the older pregnancies, as when the fetus is 6 cm. in length, it comprises more than one-half of the *vera*. It contains numerous spaces filled with venous blood. The *spongiosa* contains numerous hypertrophied glands closely packed together, between which extend trabeculae uniting the *compacta* with the myometrium, and carrying minute arterioles and venules. The arterioles are spiral in their course, as distinguished from the venous spaces of the endometrium, which exist everywhere in the endometrial stroma but are most marked at the junction of the *compacta* and *spongiosa*.

Van Tussenbroek (1893) notes, as the characteristic features of ectopic intrauterine decidua, a direct emptying of the glands into the uterine cavity; an absence of fibrinous streaks such as are present in normal pregnancy; and an opening of the capillaries directly into the uterine cavity, whereby the customary bleeding of ectopic pregnancy

results. Werth (1904) claims that there is no proliferation of the glandular papillæ in ectopic pregnancy such as always occurs in normal pregnancy (Opitz, 1903).

The entire intrauterine decidua of ectopic gestation is shed in shreds or granules at the time of tubal rupture or is discharged as an intact cast of the uterine cavity.

b. *The Tubal Decidua*.—Most tubal gestations are located in the ampulla of the organ, and the vast majority of these tubes are healthy in every respect. The reason for the orientation of the fertilized ovum in the tube instead of in the uterine fundus must, therefore, be a retardation in the transmigration of the ovum, after fertilization, from the ovary to the uterus, with a consequent development upon it of the corroding trophoderm which should not appear until the uterine cavity is reached. The abortive effort at decidual formation within the pregnant fallopian tube is, therefore, according to Johnstone, probably protective in nature.

There at once develops in the tube a series of phenomena identical, with but slight variations, with those occurring in the uterus normally impregnated, but to a decidedly less degree. Bartelmez, indeed, states emphatically that as far as his experience goes "the great development of the stroma which characterizes the uterine decidua vera has never been observed in a tube." The changes which have been noted by other observers consist in a trophodermic corrosion of the superficial tubal epithelium, which, in the absence of the thick and edematous subendometrial tissue, exposes the musculature of the tubal wall, into which the ovum penetrates and orientates; the imperfect formation of a fibrinous or partially muscular *capsularis* or capsular membrane; and the formation of a very imperfect and irregularly distributed decidua, the cells being few and widely separated. The same changes are noted in the rarer fimbrial gestations. In those cases in which the ovular implantation occurs in the narrow isthmus of the tube in the uterine wall (*interstitial pregnancy*), both the intrauterine decidua and the attempt at the formation of a tubal decidua are well-marked.

As Caturani has noted, the microscopic changes include an increase in the thickness of the tissue representing the submucous stroma, which also becomes corrugated and irregularly nodular on the surface; it contains a few decidua-like cells. "There are glandular-like invaginations of the epithelium into the submucosa, and an active proliferation of the endothelium of some blood-sinuses in the submucous stroma." A striking feature is that "the stroma has a very loose appearance, and the decidua-like cells are widely separated, never as close one to the other as in the uterus." These cells, Waegeli (1915) claims, cannot be attributed to their proximity to the uterine cavity, since they are found as well in the sections of

the walls of the fetal sac distal from the uterine cavity. Caturani believes that the prevalence of the inter-cellular fibers in the stroma of the tubal mucosa will account for the sparsely grouped cellular appearance of the tubal decidua, and that the absence of glands in the tube can easily explain the absence of a definite spongy layer.

The characteristic features of the tubal decidua, according to Caturani, are the disappearance of the surface-epithelium; an increase in the number, with modification, of the round cells of the stroma which gradually develop into decidua-like cells; a marked round-cell infiltration of the stroma; a typical arrangement of the modified stroma into rounded or columnar elevations; and an abundant network of blood-vessels and sinuses at the junction of the decidua with the subjacent tissue. A thin lamella of fibrinoid material (*Nitabuch's layer*) covers the columns as well as the reflexa and vera.

There is not the same sharp differentiation between the fetal and maternal structures as in intrauterine pregnancy; at least, this is true of the early tubal pregnancies. There may be noted more or less intermingling of the plasmodial or syncytial elements within the decidual columns. "The Langhan's cells are comparatively few and rather grouped with the plasmodium, which seems to play mainly the rôle of breaking through the decidua and decidual sinuses to secure the trophic changes for the ovum" (*Caturani*). The ill-defined region in which the maternal and fetal elements are more or less commingled and apparently engaged in deadly conflict has been aptly termed the "border zone." As has already been stated, Bartelmez has not been able to find a true decidua in the very early tubal pregnancies he has studied, and it may be that in these very young cases the ectopic decidual reaction has not yet begun to manifest itself. The syncytium (syncytiotrophoderm) in tubal gestation is, however, according to Johnstone, "always well-marked, being uniformly arranged over the outside of the entire chorionic membrane, and is always easily recognizable. * * * The syncytium is, in reality, the outer layer of the trophoderm."

ECTOPIC DECIDUAL REACTION

A curious phase of the decidual reaction is that phenomenon which seems to have disproved conclusively Webster's theory of decidual specificity for the uterine mucosa. Webster stated his belief that the Müllerian tissues only could generate a decidua—at least in man—and that the reaction occurred occasionally in the tube only as the result of faulty development. Since his memorable contribution, however, decidual tissue has been found in other locations, as the peritoneum, the ovary and the appendix, in the course of normal and ectopic gestations, and also in these places and in the cervix uteri in certain nonpregnant conditions. The investigations of Loeb (1908),

Taussig (1906) and Outerbridge (1912), all in this country, have been invaluable in establishing these facts for all time.

Taussig, who remarks, in a paper read before this Society sixteen years ago, that "in a considerable percentage of all pregnancies, no matter what the site may be, a formation of decidua-like cells is found outside the point of implantation of the ovum, even at a considerable distance from it," gave to this phenomenon the term "ectopic decidua formation," which has become generally accepted by the profession.

Webster, in 1903, first called attention to the fact that decidual tissue can be traced in some cases of normal gestation from the uterine cavity into the inner end of the nonpregnant tube for a varying extent. His observation has been substantiated by Williams (1901), Lange (1902), Mandl and others. An extension of the decidua into the nonpregnant tube has also occasionally been noted in tubal pregnancy. Taussig, in 1906, remarks that "we find in normal intra-uterine gestation, so frequently as almost to be termed physiological, clusters of decidua-like cells beneath the pelvic peritoneum, on the surface of the ovaries, and in the mucosa of the tubes. In tubal pregnancy we find an extensive decidua in the uterus, and occasionally at various points such as the nonpregnant tube, the serosa of the appendix, the omentum," and elsewhere. He reports a case of primary pregnancy of the fimbria ovarica, becoming a secondary abdominal pregnancy, with unusual decidual formation, including small patches in the mucosa of the upper cervical canal (the only case on record), as well as a remarkable layer of decidua, four or five cells in thickness, largely surrounding an accompanying parovarian cyst. Voigt (1898) reported the presence of decidual tissue in two accessory fallopian tubes in a case of fimbrial pregnancy; and Webster (1904) noticed decidua-cell formation near the site of implantation of the ovum in a case of ovarian pregnancy. In this connection, the curious case of ovarian pregnancy reported by Seneert and Aron in 1914 should be noted, in which case the early death of the embryo occurred, but the placenta and decidual tissue continued to grow and develop for two years, when they were removed by operation.

Thus far, as Taussig has noted, ectopic decidua has been encountered in the cervical mucosa; in the nonpregnant tube of an extrauterine pregnancy, and in both tubes in intrauterine pregnancy; on the uterine peritoneum; in the pelvic and parietal peritoneum; in the ovaries; in the serosa of the small intestines; in the omentum; in the appendix; and in certain pathologic structures (bands of adhesions, adenomyomata of the uterus, parovarian cyst).

Peritoneal Decidua.—Walker, in 1887, first demonstrated the presence of the decidual reaction in the peritoneum in a case of abdominal pregnancy; and Dobbert, in 1891, noted a similar change in a tubal

gestation. Both these observers thought that this peritoneal involvement was possible only in ectopic pregnancy. It was Pels Leusden, in 1895, who first called attention to the presence of patches of decidual tissue in the pelvic peritoneum in normal intrauterine pregnancy. In 1897, Schmorl found the same condition in seventy normal cases, the patches occurring most commonly on the posterior uterine surface, but also appearing on the anterior peritoneal investment of the uterus in cases complicated by adhesions to the tubes and other adjacent structures, notably the posterior wall and fundus of the bladder. In 1901, Stravoskiadis noted a development of decidual tubercles over the anterior parietal surface of the rectum, the posterior surface of the uterus, and the floor of Douglas' culdesac in fifteen cases of intrauterine pregnancy. In 1902, Kinoshita found similar tissue in Douglas' culdesac and elsewhere in eleven puerperal women; and the same year Lange, and subsequently Curtis (1915) and others have confirmed these findings. Patches of decidua-like cells have been noted on the parietal pelvic peritoneum by Schmorl (1897), Amos (1905), and Tuholske (1901), the latter in a case of secondary abdominal pregnancy. The peritoneal covering of the fallopian tube and the broad ligament have been involved in certain cases.

Schmorl states that these peritoneal patches of decidua may attain a thickness of from 2 to 3 mm. They appear as whitish tubercles or nodules varying in size from that of a fine shot to that of a pea. They are found not only just beneath the surface, but also in the deeper layers of the peritoneum or subperitoneal connective tissue, from the loose cells of which they take their origin.

They are not metastatic in nature, shot off from the intrauterine decidua, but are due, according to Outerbridge (1912), to a direct "transformation *in situ* of the subserous connective tissue cells, analogous to that occurring in the uterine mucosa." This observer further states that it is "almost always possible to demonstrate numerous intermediate stages, between the small, unchanged, fixed connective tissue cells and the large, pale, fully-developed, round, decidua-like multinucleated cells."

Omental Decidua.—Outerbridge (1912) has proved that decidua-like cells may be found in the omentum in cases of intrauterine pregnancy. He states that "the first to report decidual reaction in the omentum was Prochownick, who, in 1899, demonstrated a case of tubal pregnancy" which had aborted through the fimbriated extremity and continued to grow for seven months, the greater omentum comprising the chief component of the fetal sac. Scattered extensively throughout it "were large numbers of characteristic clumps and nests of decidual cells." Schmorl, in 1902, recorded the presence of decidual tissue in the nonadherent omentum in three

cases of intrauterine pregnancy; and the same year Lange reported a case of intrauterine pregnancy in which "groups of characteristic decidua cells were found just beneath the serosa in small multiple fibromata of the omentum." Penkert, in 1905, first carefully investigated the subject of omental decidua, his case being one of ectopic gestation in which decidual cells were found in the fatty structure of an adherent omentum, obviously springing from the cells of the fat tissue. Finally, Outerbridge, in 1912, recorded a case of abdominal pregnancy at or past term, operated upon at the Preston Retreat of Philadelphia by Drs. Richard C. Norris and E. P. Barnard, "in which the omentum, which had afforded attachment for the placenta, contained clearly defined groups of characteristic decidual cells," quite an extensive formation of decidua being found.

Omental decidua occurs either as small, white, pedunculated nodules of about the size of a pin-head or as small, grayish, translucent, flattened plaques, and these deposits are attached generally to the under surface or lower margin of the organ.

Ovarian Decidua.—Schmorl (1897) believed that decidual tissue invariably occurred in the ovaries in both normal and ectopic pregnancy. The so-called decidual cells are usually "found in the outer layers of the stroma" and occasionally also "in small groups deeper down in the neighborhood of small veins." Kinoshita (1898), Schnell (1899), Lindenthal (1901) and other observers have confirmed these findings. Taussig (1906) states that "Webster found decidual changes in four out of ten ovaries of normal uterine pregnancies. In each case the areas were situated about the surface, and the line of demarcation was distinct. Usually these areas contained dilated blood vessels." Lindenthal found decidual tissue in the ovaries of both normal and ectopic gestation in fifteen out of thirty-four cases after the third month. The spindle-cells of the albuginea had undergone the transformation into the decidua-like cells, and the process increased in intensity up to the seventh month and then showed a retrogression. Webster records an ovarian pregnancy in which the decidual formation was found in the gestation-sac near the large blood spaces surrounding the hilum of the ovary.

Appendiceal Decidua.—In 1905, Herschberg reported the occurrence of decidua-like cells in the serosa of the adherent appendix in a case of an extinet right tubal gestation. The serous coat was greatly thickened, and in its deeper layers numerous fairly large groups of typical decidual cells were found, having taken their origin from the connective-tissue cells of that region. In 1913, Outerbridge proved by two cases of appendicitis complicating intrauterine pregnancy—one occurring at six months, the decidua-like cells appearing in the serosa of the nonadherent appendix; and the other developing during labor and ending fatally the following day, the serosa of the

appendix containing groups of typical decidual cells—that it is not necessary for the appendix to be adherent to the gestation-sac nor for the pregnancy to be ectopic in nature, for the occurrence of the decidual reaction in the tissues of the appendix. Taussig (1906) concludes that “the decidual reaction in the appendix cannot be considered a uniform procedure, but is probably exceptional and dependent partly on the duration of the pregnancy, partly on the extent of the decidual reaction found elsewhere.” Apparently, the tissues of the appendix do not readily respond to the decidual stimulus.

Vaginal Decidua.—A unique case is that recorded by Freund, in 1911, in which small nodules of decidua-like cells were found in the vagina of a woman who died of septic abortion in the third month of gestation.

Decidual Reaction in Pathologic Tissues.—Taussig recorded, in 1906, a case of tubal pregnancy complicated by a parovarian cyst, in which extensive decidual formation was noted in the cyst-walls which were adherent to the gestation-sac. Amos, in 1905, and Cameron, the same year, each recorded a case of adenomyoma of the pregnant uterus in which decidua-like cells were noted in the mucosa of the tumors. As Taussig has noted, adhesions “seem to further the development of decidua, since in such cases they are very extensive.” The peritoneal covering of adherent loops of bowel occasionally shows the decidual reaction, and the adhesions themselves generally show deposits of decidua-like cells.

CONCLUSIONS

The subject of ectopic decidual reaction is of too recent development and the clinical material too scanty as yet to arrive at any definite conclusions. Outerbridge has covered the matter satisfactorily when he remarks that “ectopic decidua appears, on the whole, to be extremely fitful in occurrence, a circumstance which may be ascribed to variations in the intensity of action of the ovarian hormone, to different degrees of responsiveness on the part of the subperitoneal connective-tissue cells, or to the presence or absence of suitable local stimuli, each of these factors undoubtedly varying greatly in individual cases.” Taussig’s suggestion that the superficial location of the ectopic patches would seem to indicate that the end-products of the normal decidual reaction do not reach these points through the blood or lymph-channels, but that the placental substances pass directly through the lumen of the tubes and out through the fimbriated extremity to reach the ovarian and pelvic peritoneum where they produce sufficient irritation to cause a decidual reaction, is also worthy of consideration. This theory would seem to offer a satisfactory explanation for the comparatively great fre-

quency of the patches in the peritoneum of Douglas' culdesac, the posterior surface of the uterus and the rectal walls, the irritating material naturally draining into this region.

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OBSERVATIONS UPON THE PATHOLOGY AND TREATMENT OF HYDATIDIFORM MOLE†

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HYDATIDIFORM moles, noted but rarely in the practice of individual obstetricians, with their bizarre appearance, the rather startling nature of their usual manifestations and the fact that treatment seems so obviously to point to a simple evacuation of the uterine cavity, have combined to make the study of these teratomata interesting and profitable to the pathologist, while they offer no special inducement for investigation at the hands of the clinician.

As a natural result there is a rich and voluminous literature relating to the pathology, structure and genesis of these growths, while the management of the condition has excited but scant comment.

Observation of a series of cases has led the writer to formulate certain conclusions concerning the matter, which have been forced upon him by experience. There has been no attempt made at a generalized study of the subject, the literature on such analyses being abundant. Attention is directed to the monograph of Essen-Møller, "*Studien ueber die Blasenmole*," (Wiesbaden, 1912), and the paper of Palmer Findley.¹

*A more complete bibliography is presented in the author's reprints.

†Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

With regard to the frequency of occurrence of hydatidiform mole, there seems to be no basis for definite statements. Boivard found one in 20,000 obstetric cases. Essen-Møller gives the frequency at the Frauen Klinik at Lund as three per 1000. Krönig found one mole in 728 pregnancies, the statistics varying in such wide degree that no definite conclusions are possible.

It does seem true that moles occurring in ova aborted early in pregnancy are common. Indeed Meyer² makes the statement that "mole formation is a rare disease at or near term, but it probably is the commonest of all diseases of the ovum during the earlier months of gestation. The typical large hydatidiform mole is an end result which it has taken long months to develop. No one seems to have followed its evolution, although hydatidiform degeneration whether total or partial is, of course, gradual in its advent."

The structure of hydatidiform mole is a matter of common knowledge and requires no comment here. The variations in type of these growths, however, deserve more emphasis since the tendency toward malignant degeneration varies directly with the degree of invasive ability of the syncytial cells.

This point has been well brought out by Caturani,³ who holds that the difficulty in determining the future course of hydatidiform moles is dependent, not so much upon the insufficient knowledge of the differences in the activities of the chorionic proliferation as upon the difficulty of securing the evidence of the uterine invasion.

The limitation of curettage, which is deemed to be incomplete in the best circumstances, is greatly increased in the uterus generally softened and friable from the presence of the mole. Caturani advises anterior vaginal hysterotomy, with removal of a small portion of the uterine wall for study, as the most logical procedure.

The writer is not in accord with the theory that endometritis is an important etiologic factor in mole formation. Inasmuch as endometritis is at best a very questionable pathologic entity, and especially since moles are entirely a disease of fetal structure, the decidua not being involved, it is difficult to associate them with any lesion of maternal tissues, except insofar as trophic or nutritive errors may be causative.

The true etiology seems to lie in some specific fault in development of the chorionic villi, rather paralleling the development of general edema of the fetus and similar degenerative and proliferative phenomena whose modes of origin remain entirely unsolved.

Agreeable to this view is the interesting theory formulated by Ballantyne,⁴ who inquired as to what happens in a blastocyst, when for some reason or other, the embryo entirely fails to appear, and answers his inquiry by the statement that "if we imagine an early ovum, like

Peters', implanted in the uterine mucosa but with no embryo in it and no developing system of blood vessels, then by the continuing proliferation of the trophoblast, it might soon take on an appearance resembling that of the hydatid mole. It may be objected that an embryo is sometimes found in a mole, but this occurrence is very rare and may, when it does occur, be regarded as a twin pregnancy in which one twin is represented by a hydatidiform mole."

The statement that the occurrence of an embryo in a mole is very rare, is disproved by the statistics of the Mall collection (Meyer), many of which were early specimens, the average age being 66.6 days or $2\frac{1}{4}$ months and of these 64.4 per cent contained fetuses, the latter in an excellent state of preservation in some of the earlier cases.

This does not entirely discredit Ballantyne's view, however, since it is perfectly conceivable that in these cases there is an unbalance between the chorion and the embryo, and that excessive chorionic development results in the active proliferation before alluded to.

It is sufficient to say that with our present knowledge of the subject, the etiology of mole formation is not known, but the evidence seems to point to its being a true teratomatous phenomenon, the changes taking place in the embryonal envelope rather than in the embryo itself.

Concerning the question of the existence of a well developed mole and a living infant, there is one case reported by Meyer (q.v.) which is of such unusual interest that it is here reproduced.

CASE No. 1914. This specimen from the Mall collection filled a two liter jar and was said to have accompanied a living seven months' fetus, having been expelled between the fetus and the placenta. Only a small amount of clot and what seemed to be a small portion of placenta and membrane accompanied it. Since the placenta was not saved it is impossible to say whether the mass resulted from partial degeneration of the placenta belonging to the living child or whether it represented a degenerated living placenta, which is rather unlikely but not impossible, in view of the well authenticated cases found in the literature. This specimen is of interest not only for the numerous, large clear cysts, one of which measures 30x25 mm., which it contains, but because it accompanied the birth of a living child and because of the relative rareness of such a coincidence. According to J. W. Williams such an occurrence has not been observed in a series of over 17,930 obstetrical cases treated by the department of obstetrics of the Johns Hopkins Medical School.

The treatment of hydatidiform mole is the phase of the subject which seems to require most careful scrutiny and, in the opinion of the writer, radical revision.

An analysis of the standard text books of obstetrics used as teaching references in American medical schools reveals the following practically universal treatment of hydatid mole: Curettage of the uterus with particular care against perforation, packing in the event of severe hemorrhage. Observation of the patient for from two to three years, in order to guard against the development of chorion-

epithelioma. The mortality following this lesion, based apparently upon the results of the accepted treatment, is appalling, if the statistics are considered to be accurate.

In Findley's 500 cases the total mortality was 22.5 per cent, according to Edgar it is 13 per cent, Williams 10 to 26 per cent, and Hirst 18 to 25 per cent.

Such a death rate is the highest following any obstetric complication save only puerperal sepsis and premature separation of the placenta; it is entirely too high and should be markedly lowered. The causes of death are given as sepsis, hemorrhage, peritonitis following traumatic perforation of the thinned out uterine wall and the development of chorionepithelioma.

With regard to the first three sequelae there seems to be no doubt, but the question of chorionepithelioma is a vexed one.

In the 500 cases analyzed by Findley, chorionepithelioma developed in 157 or 31.4 per cent, though as Findley well says it is impossible to determine just what proportion of hydatid moles undergo malignant change since ordinary benign moles are not usually reported, while those which undergo malignant change are reported with greater frequency.

Caturani records seven cases of chorionepithelioma which came under his observation and treatment.

On the other hand, a pathologist of such wide experience as Symmers,⁵ states that he considers this tumor one of the rare lesions. His letter is of such interest in this connection that it is quoted in part.

"Among approximately nine thousand autopsies performed under the auspices of Bellevue Hospital, not a single chorionepithelioma has been encountered. Since the abolition of the Coroner's system and the establishment of the Office of the Chief Medical Examiner, three thousand additional autopsies in medico-legal cases have been done in this laboratory, but without finding an example of chorionepithelioma. Since the foundation of the pathological laboratories of Bellevue Hospital fourteen years ago, we have examined many thousands of tissues removed at operation, but our records include but one example of chorionepithelioma, namely, a metastatic growth in the vulva. In the same length of time twenty hydatid moles have come to our notice. In the course of the past fifteen years I have been connected at various times with the pathological laboratories at the New York City Hospital, the New York and Hudson Street Hospitals, St. Vincent's and Bellevue, and have seen but two autopsies on subjects dead of chorionepithelioma. Dr. Charles Norris, Chief Medical Examiner of the City of New York, whose experience in postmortem work has been far more comprehensive than mine, tells me that he has encountered this tumor only very rarely.

It seems to me that in arriving at a diagnosis of chorionepithelioma as the result of microscopic examination of tissues removed at operation, one should proceed with the utmost caution, in view of the fact that placental remnants may live in the uterus for a considerable length of time after the termination of pregnancy, that syncytial cells may wander widely even in normal circumstances, and that mechanically displaced chorionic villi may be sometimes found in the uterine, pelvic and vaginal veins after severe labor.

However true all this may be, the fact remains that, in my experience at least, genuine chorionepitheliomata of the uterus, that is to say, tumors that spring from the fetal side of the placenta and are locally destructive and metastasize widely, are most uncommon."

It must be conceded, then, that the relative frequency of malignant

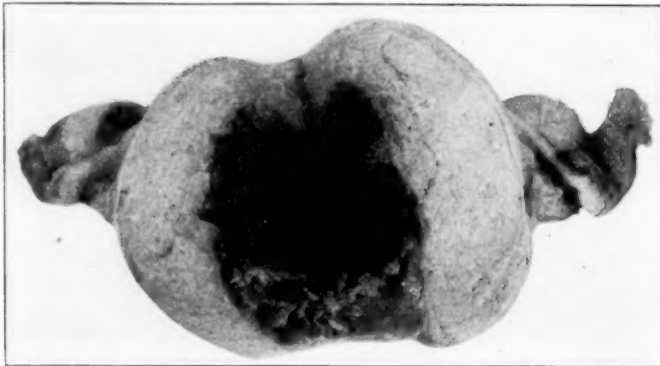


Fig. 1.—Case 194 B. Uterus after the expulsion of a hydatidiform mole. Note areas of deep invasion of uterine muscles.



Fig. 2.—Case 194 B. Hydatidiform mole expelled spontaneously from uterus in Fig. 1.

change in hydatid mole remains unsettled, our knowledge of the subject being too vague to arrive at definite conclusions.

If the facts above stated be summed up, it appears that in cases of hydatidiform mole formation there is a maternal mortality of certainly 15 to 20 per cent. That from the very nature of the morphol-

ogy of these moles it is impossible to ascertain even by examination of a portion of the extruded tissue, how widespread and deep is the invasion of the uterine muscle and because of this ignorance one is unable to determine whether sepsis from retained portion of mole, hemorrhage, or malignant change is likely or unlikely to develop in any given case.

In view of these facts, it seems rational to the writer to regard every hydatid mole clinically as a malignant tumor, carrying with it a high mortality, and in consequence to attempt no half-way measures for the removal of such growths, but to extirpate them, together with the fundus of the uterus.

This somewhat radical viewpoint is by no means original, it having

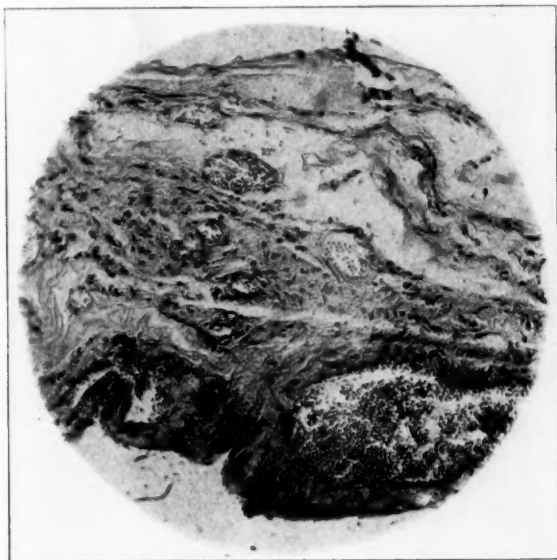


Fig. 3.—Section from uterine wall of uterus in Fig. 1 showing implantation of nests of syncytial cells deep in the muscle together with several small intramural hemorrhages.

been proposed by Freund, years ago and reiterated by Essen-Møller and Howard Taylor, especially when bleeding is profuse, the cervix rigid, and the patient near the climacteric.

The writer does not admit these limitations to hysterectomy, and feels that the more radical treatment should be a routine if the mortality is to be greatly reduced.

The procedure in detail is as follows: Upon the diagnosis of hydatidiform mole being established, no vaginal work is done whatever. Laparotomy is performed, the uterus isolated by gauze packs and an abdominal hysterotomy is done, the mole being inspected *in situ*. Should it be distinctly limited in attachment to the decidua, and show none of the little hemorrhagic areas in the uterine muscularis, which

bespeak invasion of the uterine wall, the tumor may be shelled out and the uterine wound closed, after the cavum has been disinfected with iodine.

Should areas of invasion of uterine muscle be present, however, and this is true in the majority of cases, no attempts are made at shelling



Fig. 4.—Case 631 B. Uterus after expulsion of hydatidiform mole. Several areas of deep invasion of the musculature, though not so marked as in Fig. 1.

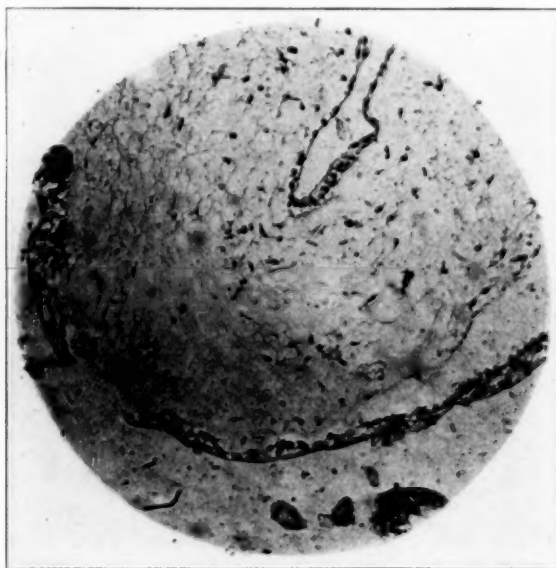


Fig. 5.—Structure of mole expelled from uterus in Fig. 4, showing usual structure of the vesicles.

out the tumor, but an immediate supravaginal hysterectomy is performed, the only exception to this plan being in the case of a primipara desirous of family to whom the situation has been carefully explained and who is willing to assume the risks of either curettage or abdominal hysterotomy with removal of the mole by this route.

By the routine employment of the technic described, it would seem that the enormous mortality following the occurrence of hydatidiform mole may be greatly reduced.

Three case histories are appended to show the characteristics of these growths and especially the findings upon hysterectomy.

CASE 194 B.—Mrs. S., forty-seven, xii para. Admitted to Frankford Hospital with a history of amenorrhea for six months, with an irregular bloody discharge for the past month. On examination the uterus was found well above the umbilicus, the cervix dilated to admit one finger. Blood examination showed hemoglobin 60 per cent, red cells 4,400,000, white cells 9200. Twelve hours after admission this patient expelled a large mole (Fig. 2), with considerable hemorrhage. Supravaginal hysterectomy was performed with the removal of a uterus 15 cm. in length. On section the organ presented the appearance shown in Fig. 1. It is apparent that with the degree of invasion of the uterine wall by this mole, both as determined



Fig. 6.—Uterus with a firmly attached mole, partly vesicular, partly carneous.

by inspection and as authenticated by histological examination (Fig. 3), curettage could not possibly remove all the growth, and that a fairly large area must remain as a potential focus for infection or malignant change.

CASE 631 B.—Mrs. C., thirty-eight, iv para, was admitted to Frankford Hospital with a history of pregnancy for six months, and irregular bleeding. Shortly after admission she expelled a moderate sized mole of the usual benign vesicular structure as shown by the section. (Fig. 5.) The hemoglobin was 40 per cent, red cells 2,470,000, white cells 16,400. On the following day hysterectomy was performed, the uterus measuring 10 cm. in length. As shown in Fig. 4 there are several deep areas of invasion of the uterine walls by syncytium, and although the case is one more favorable for curettage than the preceding one, still such operation must be attended with the danger of perforation of the thinned out uterine wall, together with the risk of retention of a portion of the growth.

CASE 1044 B.—Mrs. F. S., thirty, i para, admitted to Frankford Hospital in *extremis* following severe hemorrhage for four months. On admission the patient was bleeding freely from the vagina, the temperature was subnormal, the pulse

120, blood count revealing 26 per cent hemoglobin, red cells 3,900,000, white cells 5200. This patient on examination had a large, smooth, uterine fundus, extending to umbilicus. The cervix was hard and firm, there was no cyanosis of the mucosa and the concomitant signs of pregnancy were absent. Diagnosis of a degenerating fibroid was made and the patient given hematinic treatment for a week, after which hysterectomy was performed. The uterus measured 15x10 cm. and contained a large firm tumor (Fig. 6) strongly attached to its posterior wall. The tumor was mixed in nature, being partly vesicular and in part firm and fibrous. On microscopic examination the firm portions of the growth were found to consist of organized clot, chorionic villi and connective tissue, while the vesicular portion was characteristic of an hydatidiform mole.

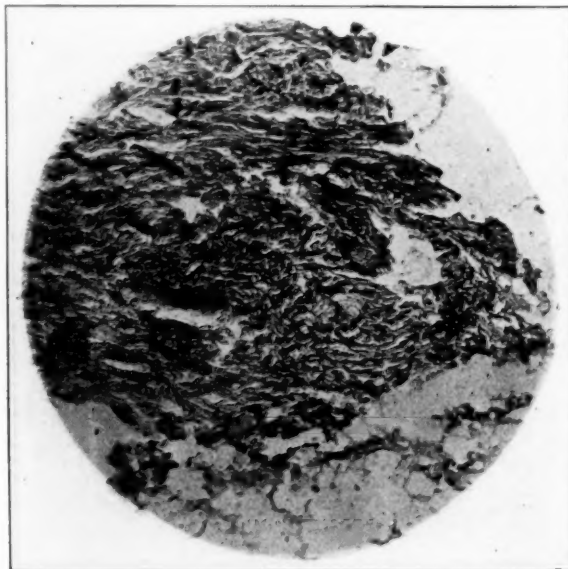


Fig. 7.—Section of uterine wall from uterus in Fig. 6, showing widespread invasion of the muscles by the syncytial cells.

Section of the uterine wall is shown in Fig. 7 and the deep and massive invasion of the uterine muscle by masses of syncytium, is well illustrated. This patient, who was a desperate risk, died of peritonitis on the third day. The others recovered with uneventful convalescences.

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1814 SPRUCE STREET.

(For discussion, see p. 427.)

PROLAPSE OF THE FEMALE URETHRA AND EVERSION OF THE EXTERNAL URETHRAL ORIFICE*

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IN this article I shall not consider those lesions occurring in infancy and childhood which might properly be classified under this title, and which have already been the subject of considerable study and the text of numerous papers written for the pediatrician. They would seem to me to have little in common with those found in middle and late life, which, in most instances at least, are due to the trauma of childbirth. We have little literature dealing with the latter, despite the fact that most gynecologists have noted them and have attempted their surgical correction. In a former article¹ I called attention to the fact that they were frequently overlooked by the casual observer. The symptoms are often ascribed to a coexisting cystocele or some other pathologic condition within the genitourinary tract and, since examinations are commonly made with the patient in a prone position and fully relaxed, they may not show themselves. When observed their importance is perhaps underestimated, since many women seem to suffer but little from their presence,—this is especially true when the lesions are of minor degree.

To return to the literature,—some of the best references are to be found in the textbooks of Kelly,² Graves,³ and Anspach.⁴ All contain excellent articles calling attention to these, as well as other frequently coexisting defects of the urethra, and offer valuable hints as to their surgical cure. In the periodicals, we find an article by Keefe⁵ (discussed by Anspach and Hunner), one by Livermore,⁶ who reports a case of eversion of the external orifice of the urethra cured by fulguration, and several other short papers by McCarty,⁷ Watts,⁸ and Murphy.⁹ These deal principally with eversions of the mucosa from the external orifice of the urethra.

The lesions to which I have restricted this paper are frequently a part of other lesions of the urethra and bladder, including especially cystocele and extensive dilatations of the whole urethra, to which I shall only make casual reference. The lesions under discussion, as stated above, would seem to be due to an injury at childbirth, and probably result from the passage of the head of the child through the narrow outlet. The lower end of the vagina and the lower portion or all of the urethra are evidently loosened somewhat

*Read at the meeting of the American Gynecological Society, Washington, D. C., May 1, 2, and 3, 1922.

from their usual close attachments to the pubes, and since those of the vestibule are less disturbed, they roll outward and upward, and from a well protected position within the vulva they become more or less exposed. This is not in evidence when the patient is in a prone position and relaxed, but becomes so when she strains, is up and about, or in the act of urination or defecation. The lower anterior wall of the vagina is thrown into folds which become permanent, and across its surface, running from side to side, one commonly finds two deep grooves a half inch or more apart, between which the mucosa is thick and sometimes hypertrophied and edematous. The urethra does not follow the vaginal mucosa into its fold or folds, but apparently remains straight and closer to the pubes. Under pressure, however, the very end of the urethra changes its direction and tilts upward. Because of the folding of the vaginal wall and the hypertrophy and edema present, the tissues are thicker at this point than usual,—this may be demonstrated in an interesting way by passing a lighted cystoscope through the meatus and following the transmitted light to the bladder.

The most important consequence of the injury remains still to be mentioned, the eversion of the mucous membrane of the urethra. It takes place very often in association with the prolapse of the vaginal mucosa and urethra, but either may be independent of the other. If we examine the urinary meatus in a virgin or nullipara we find it ordinarily very small, and no amount of straining discloses any of the lining of the urethra. In the patients under discussion, however, we find it large and gaping. The orifice seems sometimes to be simply stretched out, at other times torn. Through this orifice the mucosa rolls out under straining and the tender lining of the end of the canal becomes exposed. It occurs in varying degrees. The simplest explanation for this would be that there has been an injury to the muscular coat of the canal. Graves³ states that senile atrophy is the cause. Commonly when the strain is removed or diminished the mucosa returns to its normal protected position. Occasionally it does not, but remains permanently outside and its folds may become adherent, resisting efforts to return it to the canal.

In lesser degrees of the affection the rolling out of the lining does not take place regularly, but at one or more points the membrane is in advance of the rest and forms little papillary or polypoid projections. They are apt to become extremely sensitive. They are frequently called caruncles. The term is commonly used to include almost any sensitive projection at this point. Graves³ states that a true caruncle arises from the vestibule and is differentiated from eversions by being covered by squamous cell epithelium. In my ex-

perience a real caruncle is a most uncommon lesion. What are called such are usually eversions. Frequently in examining women in advanced life we see protruding from the meatus a small, very red bit of mucosa which is not sensitive. This is apparently an eversion, but probably because sufficiently protected, causes no symptoms.

I believe that most of the discomfort, when such is present, is caused by an exposed urinary meatus, whether the latter everts much or not. The patient complains of a feeling of soreness and tenderness, there is a burning sensation on urination and sometimes a desire to urinate frequently.

Operations for relief will vary somewhat according to the findings, and whether or not we have other lesions to deal with at the same time. A simple eversion may perhaps best be corrected by a removal of the protruding mucosa, with narrowing of the meatus by a triangular or more or less square denudation made just below the orifice and including part of its circumference. The operation is apt to be bloody, and considerable care is necessary to make the denudation of proper form and large enough. In closing the wound the meatus should be narrowed to its normal proportions. I am placing the sutures deeper than formerly in order to insure approximation for a longer period and prevent separation of the edges and a granulating wound. Where considerable mucosa is removed and a circular incision of the urethra is necessary, the stitches reuniting the mucosa to the edges of the orifice should be rather deep, catching up a fair amount of mucosa, and not tied too tightly. The edges are prone to separate, especially if catheterization is long continued, but I have had better results with continued experience.

The prolapse of the vaginal wall and urethra is best corrected by removing the redundant mucosa by a triangular incision, the base of which runs across the vagina. The apex of the triangle is towards the meatus. The denudation should include all of the redundant mucosa or more. By bringing the edges together the operator may judge as to the amount necessary to be removed. Deep sutures, which catch up first the edges of the mucosa, then the firm tissue beneath the pubes, and finally the other edge of the mucosa, avoiding, of course, the urethra, close the incision and draw the urethra and external orifice back up under the pubes where it belongs. The results are on the whole good, though I have seen partial recurrences of the prolapse.

Where incontinence exists, due to a more extensive dilatation of the urethra, an exposure of the canal by an incision along the anterior vaginal wall and a narrowing of the structures about the bladder neck may be done. Such operations do not properly come within the scope of this paper. They may be combined with those I have described.

When a cystocele exists the operation (now nearly everywhere done) of re-attaching the uteropubic fascia high up on the cervix or uterine wall and bringing it together below this point, combined with the operation described above, in my experience gives excellent results. When an interposition operation is done, if one is careful to remove the redundant mucosa of the prolapsed vaginal wall, and then to bring the fundus down snugly against the pubis, there will be but little protrusion afterwards, or at least it will be rare.

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(For discussion, see p. 431.)

CLINICAL ASPECTS OF UTERUS DIDELPHYS*

BY NORMAN F. MILLER, M.D., ANN ARBOR, MICHIGAN

FORMERLY abnormalities of the uterus were considered of very rare occurrence and of interest only as pathologic curiosities. Double uterus or uterus didelphys was even judged incompatible with life. Thus Kussmaul³² as late as 1859 is reported to have said that double uterus occurred only in the stillborn. The first mention of uterus didelphys in the living adult was in 1873 when Fränkel cited the cases of Olliver³⁸ and Bonnet⁴³ as the only two recorded cases. It was not until the late nineties that the importance and frequency of this condition became generally accepted. Pfannenstiel⁴⁷ was the first to make a definite contribution in this direction, when in 1894 he tabulated 12 cases of uterus didelphys in adults. His report was followed by others and interest in this subject at once was aroused. In 1895, Giles¹⁹ reported from the literature 21 cases of uterus didelphys, including one of his own. Since then numerous cases have been reported. Today this condition, while not of frequent occurrence, has become of sufficient importance to demand the attention of every practitioner of medicine.

For purposes of this paper 54 cases of uterus didelphys collected from the literature in addition to the case reported in detail from the Clinic of Obstetrics and Gynecology of the University Hospital, will be utilized. Only those cases presenting two distinct fundi, each with its own cervix, were considered in collecting these cases. Many reports of so-called uterus didelphys are too inaccurate to be included

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as *bona fide* cases. No doubt there are many unreported and undiagnosed cases, especially when we realize the great increase in the number of cases recorded during the past ten years, due probably to better facilities and more careful examinations.

The term didelphys is derived from the two Greek words meaning double uterus. More accurately however, the condition consists of two distinct and complete halves rather than a true reduplication of the normal uterus. This is shown by the fact that each uterus has only one set of ligaments and appendages, arising from the lateral border in each case. The cervix of each uterus communicates with the vagina which in most cases is double. The two uteri are connected by a band of connective tissue extending from their medial borders. Occasionally a peritoneal fold is found passing from the posterior surface of the bladder, between the two uteri, to the anterior surface of the rectum. This fold, the so-called vesicorectal ligament, is regarded by some as of embryonal origin and an etiological factor in the production of the malformation. One or both uteri may be infantile in character. Usually they are found in the normal anatomical position but may be displaced anteroposteriorly, or laterally.

Fertility.—From the clinical standpoint the greatest interest as well as importance, of uterus didelphys is its relation to pregnancy and labor. Thus the fertility and frequency of conception in women with this malformation is not particularly affected. In the 54 cases there were 34 married women, of which number 31, or 91.1 per cent, became pregnant. From these figures it is evident that women with this malformation conceive quite readily. One single woman in the group became pregnant, making in all 32 women who conceived. It is reasonable to assume, that were we dealing entirely with married women, in whom this malformation was uncomplicated, fertility would be even greater than normal because of the two uteri. Cases associated with atresia of the cervix or vagina, infantile uterus, infantile vagina or both, retention complications, etc., greatly lessen the chances for conception. This may be directly because of the peculiar anatomical structure and position or indirectly in causing dyspareunia or preventing coitus altogether. Earlier observers reached similar conclusions regarding fertility. Thus of the cases tabulated by Pfannenstiel in 1894, pregnancy occurred in 12, while 14 of the 15 married women in cases collected by Giles¹⁹ became pregnant, or 92 per cent.

Site of the Pregnancy.—In the 32 women of this series who conceived there was a total of 67 pregnancies. In five of these women pregnancy occurred in the right uterus only. In nine it took place in the left uterus only. In seven it occurred in both uteri, while in 11 the side in which pregnancy took place was not mentioned. While pregnancy may occur in either or both sides, the deciding factor in uncomplicated cases appears to be the degree of development of the two uteri. This development may vary considerably and in many cases the uteri are so poorly developed, so infantile in character, that it is doubtful if pregnancy could ever occur. In cases associated with

double vagina, pregnancy is usually confined to the uterus connecting with the larger vagina, fertilization through the smaller vagina, especially when it is merely a tiny canal, being impossible. The size of the uterus on examination does not bear any direct relationship, nor is it a criterion, to the degree of development. In only three of the five cases where pregnancy occurred on the right side alone was the right uterus the larger previous to conception, and only four of the nine left-sided pregnancies revealed a larger left uterus previous to conception.

Interruption of Pregnancy.—This occurs far more frequently than in normal uterine pregnancy. Thus it is interesting to note that while the fertility and frequency of conception in these cases is not particularly affected, the chance for a normal spontaneous birth at term is only 41.7 per cent, occurring in 28 of the total 67 pregnancies. Abortion or interruption of pregnancy before the period of viability is the chief cause for this low percentage. Thus 19 of the 67 pregnancies aborted in the early months, or 28.3 per cent of all pregnancies occurring in women with this malformation abort in the early period of gestation. Giles found that 21.4 per cent of these cases abort, occurring in three of the thirteen cases reported by him. Bayard⁵¹ reported fourteen abortions in 14 cases of double uteri. De Lee⁶⁰ places the abortion rate in general at approximately 24 per cent, which would make the rate in cases of uterus didelphys, no higher than the general average. It must be remembered, however, that approximately 32 per cent⁵⁰ of all abortions occurring in women in general are self-induced, while in not one of the 32 pregnant women of this series was there a history of self-induced abortion. No doubt the malformation itself would in many cases lessen the ease of self-induced abortion. While it is impossible to state definitely the cause for this high rate of abortion, it is, nevertheless, of speculative interest to consider abnormal implantation of the ovum produced by the malformation, as well as the malformation itself. Malposition of the gravid horn must play an important rôle in interruption of pregnancy, just as the normally pregnant displaced uterus may terminate gestation. What bearing infantile development of the uterus would have on pregnancy is a question. Marked underdevelopment of the uterus would render it incompatible with pregnancy. No conclusions regarding the effect of retention complications upon fertility can be made, since in only one reported case with this complication did pregnancy occur.

Premature labor any time after the period of viability was the next most common cause for interruption of pregnancy before term. In seven of the 67 pregnancies birth took place prematurely or in 10.4 per cent of all pregnancies. One of these patients was delivered by

abdominal cesarean section, being unable to deliver by the natural route due to obstruction by the other nongravid half of the uterus.

The predisposing causes of premature labor are the same as those of abortion. Whether the enlarged nongravid half of the uterus could be considered an important etiological factor because of the congestion set up by its menstrual cycle is merely speculative. If the true cause of labor were clearly understood premature interruption of pregnancy in these cases could be more easily explained.

Deliveries at Term.—Of the 67 pregnancies, 41 or 61.1 per cent went to term. Yet only 28 of the 41 cases, or 68.2 per cent, were delivered normally. In other words only 41.7 per cent of all pregnancies occurring in women with this malformation have normal confinements. It is evident then, what may be expected of these cases during pregnancy and labor.

Causes of Dystocia.—The complicating factors in the abnormal deliveries at term were as follows in order of frequency: (1) enlarged nongravid half of the uterus; (2) vaginal septum in cases associated with a double vagina; (3) uterine inertia; (4) tetanically contracted uterus; (5) retention complications and (6) eclampsia. In three of the thirteen complicated deliveries at term or in 23 per cent of all cases complicated at term, the enlarged nongravid half of the uterus was the obstructing factor. In one premature delivery dystocia was due to this same cause. Thus four, or 5.9 per cent of all deliveries occurring in women with this malformation are obstructed by the other uterus. Obstruction from this source seems all the more plausible when we recall as mentioned by Handfield-Jones³⁸ that the nonpregnant half enlarges in sympathy with the gravid half during pregnancy, thus increasing its potentiality as a complicating factor. Obstruction to delivery from this source acts in two ways: First, because of its size, in preventing progress of the presenting part and second, because of its close anatomical relationship, in displacing the pregnant uterus from the direct axis of the parturient canal. Apparently where the pregnant horn is encroached upon by the nongravid half, this occurs either in the early months of pregnancy, causing incarceration due to enlargement and the peculiar anatomical situation of both uteri, or during labor when the process of delivery may be seriously impeded. While this malformation does not absolutely contraindicate version and extraction, it is nevertheless full of possibilities and it would be well to consider these in any case where this procedure is contemplated. Although 41.7 per cent of the pregnant women who have this malformation have normal spontaneous deliveries at term, it seems reasonable to believe, that many of these apparently normal labors are prolonged and tedious,—in some due to the obstructing other half and in others to the vaginal septum or both.

In two of the complicated term deliveries the vaginal septum was to blame. No doubt many unrecorded cases meet with obstruction to a greater or lesser degree from this same source. In most cases, this vaginal septum is obliterated after the first parturition. In one case mentioned by Wells,⁵² however, the septum withstood seventeen labors.

Uterine inertia was the cause for interference in two cases. While this is one of the most frequent reasons for interference during labor in general, the probable occurrence is vastly greater in cases with the malformation under consideration. The vaginal septum and enlarged nongravid half of the uterus, both diagnosed and undiagnosed, are prominent in its production. The fact that many of these patients have genitalia of an infantile character would also aid in the production of inertia during labor.

In one case of tetanically contracted uterus, due to marked obstruction in delivery, cesarean section was necessary. More frequent occurrence of this complication might be expected since one factor at least is always present.

One case was complicated at term by eclamptic convulsions. This may have been of mere incidental occurrence and yet it seems reasonable to believe the existence of a predisposing factor in some cases, as for example the case reported, from our clinic, where one kidney was absent. The increased requirements thrown on the one available kidney in such cases might easily be an important factor in precipitating a nephritic toxemia of pregnancy. How frequently such relationships exist is a question; the possibility, however, remains.

Complication Due to Atresia.—This may prove a serious obstruction to delivery, as illustrated by Wendling's case (mentioned by Wells), where a dead child was extracted after incision of the vaginal wall and drainage of a large amount of retained fluid. Pregnancy, however, occurring in these cases must be very rare. Of the eleven cases of uterus didelphys associated with retention complications, pregnancy occurred in but one.

Means Employed to Terminate Complicated Pregnancies.—Of the cases necessitating interference, forceps were required in four, version and extraction in three, cesarean section in two and manual removal of the placenta in eight.

Thus four of the forty-one term deliveries, or 9.7 per cent of all cases going to term required forceps. Two of these were for inertia, one for aftercoming head in a version and extraction. The indication for the fourth case could not be determined. With the ever present potentially complicating factors it is natural to expect more frequent indications for forceps. This becomes evident when we realize that encroachment by the other nongravid half occurs most fre-

quently during labor. The infantile character of the genitalia again produces more frequent necessity for interference.

Version and extraction were performed in 7.3 per cent of all term cases. All three of the version cases, however, were further complicated. Thus one required forceps for the aftercoming head, another manual removal of the placenta and in the third case extraction was greatly prolonged and complicated by the other uterus. These cases where the complicating factor has already demonstrated its presence and power in obstructing normal delivery would seem poor risks for version and extraction.

Abdominal cesarean section was performed in two cases, in one because of a tetanically contracted uterus during labor at term, the other because of dystocia due to the enlarged second uterus. This operative procedure, however, is probably more frequent than would appear. Thus Scott⁵³ reported ten cases of rupture occurring in double uteri in varying degree. Forty per cent of the total number of cesarean sections in his report were for this complication. The possibility of rupture of the uterus must ever be borne in mind especially in the type of case mentioned by Wells, where pregnancy occurred in the rudimentary horn of the malformed uterus, the cervical portion of which was largely fibrous and incapable of carrying out properly the functions of a normal cervix during labor. Potocki⁴⁶ warns us of this danger, especially in cases of a second pregnancy occurring in uterus didelphys, where the first delivery was accomplished by cesarean section.

While abnormal presentations are more common in certain types of uterine malformations, such is not the case in uterus didelphys, except when pregnancy occurs in both uteri at the same time.

Complications in the Third Stage and Puerperium.—Not only are pregnancy and labor complicated in cases of uterus didelphys but also the third stage and the puerperium. Thus in the total 67 pregnancies, manual removal of the placenta was necessary in eight cases, or 11.9 per cent of all third stages were thus complicated. Three of these followed premature stillbirths, three followed abortion, one followed a version and extraction and one a forceps delivery. It is doubtful whether there is any special significance to be attached to the frequency of this complication. Retention of the secundines is not unusual in abortion in premature deliveries. In patients confined at term it is of infrequent occurrence. Where this occurs in cases of uterus didelphys it is probable that the malposition, and interference with the normal uterine contractions by the other half of the uterus are etiological factors.

The complications which uterus didelphys may produce does not cease with the third stage. Thus postpartum hemorrhage and subinvolution occur more frequently than in normal cases, the nonpreg-

nant half of the uterus acting like a full bladder in preventing normal postpartum contractions of the gravid uterus. Free drainage of the lochia might readily be prevented by the malposition of the uterus, due again to its obstructing companion. Postpartum retroversion also tends to occur more frequently.

Next in importance to obstetrical complications are the so-called retention complications. Thus hematometra was found in eight of the fifty-four cases, or in 14.8 per cent; on the right side in seven cases, while in one case the side involved was not mentioned. Pyometra was reported in only one case, occurring on the left side. These cases present an ever existing danger in that they may become infected and rupture through the fallopian tubes into the peritoneal cavity (as occurred in the cases of Williams⁵⁵ and Fordyce⁴⁹) with the possibility of fatal peritonitis.

Double uterus occurs nearly always with double vagina. Of the total 54 cases 42 were associated with double vagina. Three cases had a single vagina and in nine cases the vagina was not mentioned. In eight of these cases there was an associated hematocolpos, occurring on the right side in six cases and on the left side in two cases. This condition was found in 14.8 per cent of all cases reported. In one case pyocolpos was reported on the left side and associated with a pyometra of the same side. In patients with retention complications the average age at the time of diagnosis was considerably younger than where this condition did not exist. Far more rare but of great importance are the unusual complications which are occasionally associated with uterus didelphys. Cases associated with ectopia of the bladder,⁴³ double vulva, double urethra, double bladder,⁷ fibroids³² have been reported. The case presented in this article was associated with a pelvic kidney. The left kidney was absent while at the level of the last lumbar vertebra there was found a rudimentary and retroperitoneal kidney.

CASE REPORT.—Miss L., age fourteen, single, admitted to the University Hospital on August 4, 1920. The patient's family and personal history was unimportant up to the time of puberty. Menstruation began in January, 1920, eight months previous to the time of admission. Her periods had always been irregular, with intervals of one or two months, their duration being four to five days. During her period she complained of pain in the lower abdomen, this pain gradually subsiding at the cessation of the period. There was no history of menorrhagia or leucorrhea. Her chief complaint at the time of admission to the hospital was continuous pain in the lower left quadrant, more severe at the time of her periods. The present trouble began about June 14, 1920, with severe pain in the abdomen especially in the lower left quadrant. This was associated with some fever and general symptoms. There was no history of chills, nausea or vomiting. On June 21st, 1920 she was operated upon for appendicitis. Convalescence from the operation was normal. The pain in the abdomen, however, persisted and on August 4, 1920 she was admitted to the University Hospital.

Examination showed the patient to be of medium size and well nourished. The blood pressure was normal. Abdominal examination revealed marked tenderness over the lower portion of the abdomen, more especially on the left. A mass, exceedingly tender to palpation, could be felt extending four finger breadths above the pubis on the left side, passing inward and toward the right. Vaginal examination was not made because of the patient's age and the unruptured hymen. A bloody vaginal discharge, however, was noted. The examination was made at the time of the patient's menstrual period and the fact that she was apparently menstruating normally was largely responsible for the correct diagnosis not being made. Rectal examination revealed a tender mass, almost filling the left side of the pelvis and extending over to the right. Nothing definite aside from this fairly solid tumor mass could be made out. The patient was further examined by X-ray following inflation of the peritoneal cavity with carbon dioxid gas but as it turned out afterwards the plates were wrongly interpreted.

Provisional diagnoses of dermoid, solid tumor of the ovary, or pelvic kidney were made. The fact that the patient was apparently menstruating led to the belief that the uterus was not involved in the tumor mass, while the firmness suggested solid tumor of the ovary or possible pelvic kidney.

On August 10, 1920, the patient was operated upon and the true condition of uterus didelphys, left sided hematometra and hematocolpos, absence of the left kidney with a rudimentary retroperitoneal kidney situated at the level of the last lumbar vertebra, found. Upon opening the abdomen, what was apparently the uterus was seen well up toward the abdominal wall, overriding the mass below. The left tube was noted, leading off from the above mentioned uterus, and closely attached to the ovary, which was enlarged to the size of a small hen's egg, and lay markedly contorted posterior to the uterus above the large mass in the pelvis. The right kidney was definitely enlarged and in normal position. The left kidney was absent. The left tube and ovary were freed from adhesions, and the mass beneath further investigated. An attempt was made to aspirate the pelvic mass but nothing was obtained. The absence of the left kidney and the presence of the mass in the pelvis plus numerous adhesions made the diagnosis questionable for the time being. An incision was made in the anterior surface of the tumor and a large amount of old thick dark blood escaped. Further dissection revealed the true pathology. The small right uterus, with its tube and ovary, was found. It communicated with a tiny vaginal canal, and it was from this source the confusing menstrual flow had come. The enlarged left uterus with its bloody content, communicated with a left sided hematocolpos. Because of the damage which had been done in freeing adhesions and determining the nature of the condition it was necessary to remove all the pelvic organs. It was during this procedure that the rudimentary, retroperitoneal kidney was found. It was connected to the bladder by a dense band of fibrous tissue apparently the rudimentary ureter.

The patient made a slow but uneventful recovery and was discharged from the hospital three and one half weeks later.

Diagnosis of This Condition.—This in many cases is not made until after an exploratory laparotomy, or the abdomen is opened for some other reason. Unless there is a definite history of severe menstrual disturbance, delayed onset of menstruation or semimonthly show of blood, little value can be placed on the history from that point of

view. Dysmenorrhea is suggestive and in considering the cause, this type of malformation should never be forgotten. Painful menstruation occurred in 11 of the 54 cases, or in 20.3 per cent. Four of these cases had both hematometra and hematocolpos, while in one case hematometra alone existed. The other six cases were attended by no retention complication whatsoever. History of abdominal pain is of little diagnostic value since it occurs so frequently in other conditions. Abdominal pain, however, occurring in a case of uterus didelphys is always suggestive of an associated retention complication. Menorrhagia is apparently incidental. In Giles' series two patients complained of dysparunia and Ricketts⁵⁷ mentions that the urethra is frequently used for coitus in cases where the vagina is impractical. Amenorrhea is rare except in cases with retention of the menstrual flow. In these the diagnosis is frequently made early, the symptoms being of sufficient severity to demand early and careful examination. Thus in the cases with retention complications the diagnosis was made on the average of two and one-half years after the onset of menstruation. In cases where no retention existed the average age at the time of diagnosis was 27 or an average of 11 years after the onset of menstruation. The average age at the onset of menstruation was fifteen. In one case it began at twenty-six years and in several it was absent. Vaginal examination should always be made, under anesthesia, if necessary, when this condition is suspected. Rectal examination is not infrequently of great value. Any malformation of the external genitalia should lead to suspicion and if associated with an undiagnosed mass in the pelvis careful exploration of the uterus with a sound should be instituted. Holbans⁵⁸ sign, the palpation of the so-called vesicorectal ligament, extending from the bladder to the rectum between the two uteri, has been found in some cases. In differentiating the mass from ectopic pregnancy, Williams⁶¹ reminds us of the fact that the round ligament comes off the proximal side of the tumor in ectopic gestation while in uterus didelphys it comes off the lateral or distal portion. Pfannenstiel concluded that the pelvis of women with this malformation were slightly enlarged, an interesting fact, but of little diagnostic value. The absence of the other abnormalities means nothing while their presence should always suggest the possibility of uterus didelphys. In the case reported by G. G. Ward, Jr.,⁶² there were found besides the malformed uterus, stigmata of degeneration, short phalanges of the hands and feet, chondrodystrophic changes in the long bones as revealed by radiography. Two cases, one reported by Gemmell and Paterson⁵⁹ and one by Von Engel⁷ showed double vulva, vagina, urethra and bladder.

The treatment of these cases will naturally vary considerably. Surgical interference except in cases associated with retention com-

plications, is rarely called for. In cases of hematocolpos, incision and free drainage of the occluded vagina is sufficient. For hematometra, hysterectomy may be indicated. Cases presenting no definite indication for interference and having no symptoms should be let alone and all treatment limited to prevention of abortion, guarding against incarceration in the early months of pregnancy and in being prepared for interference during labor. The progress and course of labor as well as the early puerperium should be closely watched.

CONCLUSIONS

1. Uterus didelphys is of more frequent occurrence than is generally believed. 2. Its greatest clinical importance lies in its relation to pregnancy and labor. 3. Only 41.7 per cent of women with this complication have normal spontaneous deliveries at term. 4. Forty per cent have complicated deliveries at term. 5. Abortion and premature labor occur frequently. 6. Most cases are associated with a double vagina. 7. Retention complications exist in 17 per cent of all cases. 8. Treatment should be conservative whenever possible.

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DEGENERATION OF CONSERVED OVARIES AFTER HYSTERECTOMY IN RAT; AN EXPERIMENTAL STUDY*

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GYNECOLOGIC surgeons are not yet in accord on the question of conservation of sound ovaries in hysterectomy. In operations for malignant neoplasms or where the ovaries are diseased, there is complete unanimity of opinion that both ovaries should be removed with the uterus; but as regards those cases in which, to all intents and purposes, the ovaries are healthy, gynecologists are still divided.

There have recently appeared the results of a follow-up study by Hawkes¹ in a series of cases in which hysterectomies had been performed, some with conservation of one or both ovaries, and others with removal of both ovaries. The author found that in 20 per cent of his cases there had occurred during the first three months after operation either an enlargement of the retained ovary or distinct pain at the site of its retention. These conditions were temporary in all cases except two. One patient developed an ovarian cyst about 15 cm. in diameter. In a second case the retained ovaries became cystic and adherent. The author concludes that healthy ovaries should be conserved because (1) the onset of vasomotor disturbances is delayed and their severity diminished when one or both ovaries are retained; and (2) very little serious harm is caused by a retained ovary.

Polak² studied a series of 300 cases in which hysterectomy had been done with conservation of the ovaries. These patients were followed for five years, and during this time it was found necessary to perform a secondary operation upon 73 (24 per cent) for cystic changes, cirrhosis, adhesions, and infections of the retained ovary. In his conclusions, Polak states that the average period of life of the retained ovary is two years and that the retained ovary is always a focus for possible trouble.

*The experimental work here reported was done in the laboratories of the Institute of Cancer Research, Columbia University.

Read before the New York Obstetrical Society, Meeting of April 11, 1922.

Graves,³ in a careful and thorough study of this problem, concludes that after extirpation of the uterus, vasomotor disturbances ensue with approximately equal frequency whether the ovaries be retained *in situ*, totally ablated, or transplanted, and that retention of ovarian tissues after hysterectomy is of little or no value and may be productive of serious harm to the patient. On frequent occasions he has found it necessary to remove ovaries that had been left in at previous operations, and in every instance, they were cystic, degenerated, and adherent. Paradoxical as it may seem, he has had several cases in which retention of ovaries was followed by severe menopause symptoms that were made to disappear completely after a secondary operation in which the ovaries were ablated. This he explains on the assumption that any break in the utero-ovarian function creates a disharmony evidenced by the so-called vasomotor disturbances, etc., and brought on as a reactive disturbance in the internal secretory apparatus. Extirpation of the ovaries removes the source of irritation and the glandular system resumes its normal balance. He cites several cases, the clinical courses of which logically bear out his statements and apparently prove his theory.

Both Walthard⁴ and Schickele⁵ found that the menopause symptoms occur in approximately 50 per cent of all their cases of hysterectomy irrespective of retention or ablation of the ovaries. These figures correspond with those of Graves. Dickinson,⁶ on the other hand, in a thorough follow-up study of his cases found that when one or both ovaries were retained, there was complete freedom from symptoms in over 80 per cent of his patients. These findings are especially remarkable in view of the fact that in the normal natural menopause about 50 per cent of all women develop the usual symptoms. Vineberg⁷ has found it necessary on several occasions to do a secondary operation for adherent cystic ovaries, and, therefore, advocates total ablation in all cases of hysterectomy. Grad⁸ has on three occasions found it necessary to perform a secondary operation for the removal of the degenerated and cystic ovaries which at the time of the original operation were perfectly normal. Tuffier⁹ maintains that ovaries are of no use without the uterus. Clarke and Norris¹⁴ in a very recent publication conclude that "Better end results and greater comfort to the patient can be secured as the result of ovarian conservation" and that "conserved ovaries seldom give subsequent trouble."

In an attempt to throw some light on this question, the author decided to approach it from the experimental side. In view of the fact that practically all operators—Dickinson,⁶ Polak,² Sampson,¹⁰ etc.,—found that when the ovary with its corresponding tube is retained disturbances are less likely to occur, it appeared to the writer that besides the factor of vascular disturbances, the influence of a

possible secretion from the tube might come into play. In order to study this possible factor, the experiments were arranged accordingly.

As a result of a number of dissections in the rat, the blood supply of the internal genitalia was determined to be as follows: The uterine artery is directed toward the lower part of the uterus and divides into an ascending large branch and a descending small one. The former runs parallel with the uterus in the mesosalpinx and near the termination of that organ anastomoses with a branch of the ovarian. The latter arises either from the renal artery or directly from the abdominal aorta, runs outward toward the ovary and when about 1 cm. from this organ divides into three to five branches. Those cephalad go directly to the ovary and one or two caudad anastomose with the uterine. From the diagrammatic sketch, it can be seen that whenever the uterus is removed *in toto* it practically always follows that the ovarian circulation is distinctly interfered with.

In a comprehensive study of the blood supply of the ovary, uterus, and tube in the human subject, Sampson¹⁰ showed the close interrelationship that obtains, and the ease with which the ovarian circulation can be interfered with, especially when the tubes are removed. In a similar study of blood-vessel injection experiments, Keitler¹¹ came to the conclusion that it is practically impossible to avoid injuring the ovarian branch of the uterine artery during the performance of a hysterectomy. He also showed that in the rabbit the blood supply of the ovaries is quite independent of that of the uterus, and that in these animals a carefully performed hysterectomy is not followed by ovarian atrophy. It seems to the writer that Mandl and Buerger,¹² Burkhardt,¹³ and the other investigators who found ovarian atrophy after hysterectomy in the rabbit after a period of eight months to three years were dealing with senile physiological changes rather than with artificial ones produced by surgical interference.

In this study young but sexually mature female rats were employed. In one series, 5 in number, when the hysterectomy was performed the uterine blood vessels were deliberately cut through at both the distal and the proximal ends. In a second series, 6 in number, the hysterectomy was performed so as not in any way to injure the blood supply of the uterus or of the ovaries. In a third and fourth series, the same procedures were followed as in the first two groups, only a hemihysterectomy, however, being done. The animals were killed at intervals of 10 days to 11 weeks. In these four series, both ovaries were removed at the time the animal was killed. As a further means of control, a fifth series was employed where complete hysterectomy was done with all precautions not to injure the blood supply. Here, however, one ovary was removed at the time of operation and the other when the animal was killed.

The results based on a microscopical serial section study of the ovaries showed the following: In the first series, in which the hysterectomy was performed with total disregard of the blood supply, the retained ovaries presented distinct signs of degeneration. The intensity of these degenerative changes varied directly with the interval of time between the operation and the death of the animal. This is in complete accord with clinical experience and is due to the absence of the formation to a collateral circulation. In the second series, in which the attempt was made to preserve the blood supply, the same degenerative changes were found in the ovaries as were noted in the first series, in which no attempt was made in this direction. Here, too, the degenerative changes were more marked as the post-operative interval lengthened. When half of the uterus was removed and the blood vessels deliberately severed, the ovary on the non-operated side was normal, that on the side where the hemihysterectomy was performed, was degenerated. Here, again, the intensity of the degenerative changes increased with the time interval after operation. In the series in which hemihysterectomy was done and precautions were employed not to injure the blood supply, the ovaries on the operated side, except in two instances, showed degenerative changes. These two cases may be explained on the ground that possibly the ovarian arteries in these animals sent their largest branches directly to the ovaries, thus practically insuring this organ a normal blood supply. It could not have been due to any secretory influence from a possible secretion from the other half of the uterus because, if this were the case, in all the other operations where half of the uterus was preserved the ovary on the excised side would have had the same normal structure as on the nonoperated side.

The degenerative changes can be thus briefly summarized. In the early cases only the ovum was abnormal. The outline of this body lost its regular circular form and became scalloped or irregularly ovoid. The cytoplasm appeared mottled and irregularly granular. In some instances the nucleus was pycnotic, in others it was completely missing. In practically all cases the nucleolus was not seen. In the later changes, it was noted that the granulosa cells of the graafian follicles stained rather poorly, especially the cells toward the center. Frequently, while the outer cells were apparently quite normal, those in the center had lost all their staining characteristics. The regularity of their arrangement began to disappear first in the center and then progressively toward the periphery. The zone of granuloma cells diminished in size until in the later stages all that remained were well defined cysts with one or two layers of granulosa cells. In these cases the ovary presented the appearance of a multiple microcystic body. The granulosa cells in addition to these changes, also became

in places pycnotic and its protoplasm presented marked degrees of karyorrhexis and of karyolysis. The follicular space, in the advanced specimens, contained large desquamated granulosa cells that had no resemblance at all to the original ones. Occasionally a few neutrophilic leucocytes were seen in some of the follicles. In no case was any exudative or inflammatory reaction seen. Macroscopically, no adhesions were encountered between the ovaries and any of the adjacent tissues or organs. The changes were purely retrogressive, degenerative ones.

CONCLUSIONS

In consideration of the numerous clinical evidences of degeneration, especially cystic, and in view of the evidences of degeneration that were almost invariably found in the ovaries of the animals studied in these experiments, it seems that one may justly conclude:

1. That conservation of sound ovaries where the uterus is removed is of no avail in preventing distressing menopause symptoms.
2. That the dangers of cystic and other degenerative changes are so great that the retention of the ovaries constitutes a serious danger.
3. That it is safer to remove the ovaries in all cases where a hysterectomy is performed.

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(For discussion, see p. 434.)

THE INFLUENCE OF THE PLACENTA ON THE MAMMARY GLAND.

By C. M. STIMSON, M.D., PHILADELPHIA, PA.

IN the process of lactation two interesting phases present themselves for consideration: first, the physiologic hypertrophy which the mammary gland undergoes during pregnancy, beginning soon after the implantation of the impregnated ovum and lasting until the termination of pregnancy, and, second, that represented by the actual appearance of the milk. It is with the latter that this communication has to deal.

Whatever may be the cause of the physiologic hypertrophy, whether ferments or hormones of fetal or ovarian origin circulating in the maternal blood, activating the gland to take on increased size preparatory to supplying nutrition for the child, it is certain that something holds in check the actual appearance of the milk until it is needed, else why would not a pregnant woman with large engorged mammae begin lactating in the latter months of pregnancy when the gland has attained its full size? There is evidently some automatic inhibitor exerting its influence during pregnancy, controlling the appearance of milk until the third day, usually, after the birth of the child or the termination of pregnancy in miscarriage. I believe this inhibitor to be the placenta, and have clinical evidence which strongly suggests this view.

For several years I have observed that in cases of incomplete abortion, or miscarriage, near or after the fifth month, milk does not usually appear in the breasts until after the detachment of all the placental tissue. Not all cases of incomplete abortion, however, lend themselves to this observation as in early abortion there may be little, if any, breast disturbance. In miscarriage after the age of viability, where there is adherent retained placenta, that is, where a considerable quantity of placental tissue retains its attachment to the uterine wall, it will be observed that lactation is usually held in abeyance until this tissue separates. I have observed this in many cases and hence almost conclude that when milk appears in the breasts no placental tissue, or at least not enough to furnish an inhibitor, remains attached in the uterus. Simple detached retained placenta acts, I believe, as a foreign body and has little if any influence on the mammary gland.

My attention was called to this matter about ten years ago by the following case:

Mrs. B., para, viii, thirty-six years of age, gave birth to a full term normal child after a normal labor. Much to her surprise, for she had nursed all her children, no milk appeared in her breasts up to the tenth day, the time she was discharged, and the baby was put on the bottle. Three days later I was called in a hurry and found that after a few pains the patient had expelled a mass about the size of a lemon, accompanied by a little bleeding. Upon examination the mass was found to be placental tissue which showed no evidence of degeneration and appeared to be freshly detached. This was thirteen days after the birth of her child. Three days later, to my surprise, I found her nursing her baby, milk having appeared that day. She continued nursing the child until the regular weaning time.

I intended waiting until I had other similar cases to report but thus far, after having had a considerable number of maternity cases, have not been fortunate enough to run across another similar case, and am reporting this in the hope that others may, perhaps, confirm my observation.

It would appear that during pregnancy there is something in the maternal blood that inhibits the actual process of lactation; that when this substance is removed (eliminated) lactation occurs; that in the case above cited lactation did not occur during the presence of attached placental tissue within the uterine cavity; that in certain cases of abortion milk does not appear in the breasts while placental tissue remains attached in the uterus. The thought, therefore, suggests itself that the placenta furnished the inhibitor to the mammary gland, holding it in check until there is a demand for its functioning. Conclusions cannot be based, however, on one case or on several cases, and it is to be hoped that other clinical observations will be made to check up these findings.

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Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FORTY-SEVENTH ANNUAL MEETING

WASHINGTON, D. C., MAY 1, 2, 3, 1922

(Continued from September issue.)

DR. EDWARD P. DAVIS, of Philadelphia, Pa., read a paper entitled **The Uterus After Cesarean Section**. (For original article see p. 335.)

DISCUSSION

DR. WILLIAM E. STUDDIFORD, NEW YORK CITY.—I would like to take up the question of the cesarean section scar and what it will stand in the presence of a second pregnancy. Of course, if we have an absolute indication, a second cesarean section is always indicated, but in these days, when cesarean section is done for many other conditions, when it is possible for a woman to have a child by normal labor, the question of the strength of the cesarean scar is important. I notice in Dr. Davis' abstract he has given first place to the question of suture of the uterus, next the question of sepsis as an indication of the strength of the scar. I believe there is one other element that should be added of which little note is made in the literature, and that is the question of the location of the incision in the uterus.

As you look over the literature of cesarean scars and ruptures, you will find in many cases where rupture has occurred it has been through a fundal scar. This was one reason for the giving up of the transverse incision.

In the past five or six years I have seen three cases of rupture following cesarean section, and in every one of these the incision was either made at the fundus or away from the median line, usually an oblique incision extending through the left horn of the uterus down through the middle of the uterus, probably because the operation was rapidly done, and no attempt made to rectify the rotation of the uterus to the right. I also think one reason for the failure to obtain a firm cesarean scar in the uterus, especially in cases performed after prolonged labor, is due to the marked thickening of the fundal muscle; that is, as the uterus retracts the fundus becomes very much thickened, and if there is no advance of the child, there is a thinning out of the lower and intermediate segments. Usually the uterus in that case is drawn forward, so that if the high incision is made in the abdomen, the incision in the uterus is apt to be made posterior to the fundus. If such a uterus is sutured after the child is born, the uterine muscle is drawn together and sutured when it is in tense retraction, with thinned out lower and intermediate segments, with the result that as the uterus undergoes involution and the muscle readjusts itself, the sutures in the thickened portion of the muscle begin to loosen up. This produces a separation of the edges of incision, especially of its inner portion, while the peritoneal edges of the incision unite promptly, not being under so much strain. Many of the bad results found on secondary operation are probably due to the relaxation of the sutures occurring in thick retracted muscle shortly after operation.

The same thing applies to the use of pituitrin at the time of the cesarean opera-

tion. If you give pituitrin before the uterus is opened, you will find that you get marked contraction of the uterus, and by the time the sutures are in place and tied, the uterus begins to relax, with the result you have some loosening of the suture line along the course of the incision. I have had a chance to test this out several times this winter, withholding pituitrin until the uterus was sutured. Soon after injection was made a tremendous tension could be observed along the course of the scar. The reverse of this holds equally well if you suture the uterus while the pituitrin is active. As the effect diminishes, the suture line relaxes, and there is a possibility of having hemorrhage between the sutured surfaces resulting in a badly healed uterine scar. I think many of these cases we have called sepsis are really due to a separation of the scar on the interior of the uterus caused by such conditions of the uterine mucosa. The external layer of muscle and peritoneum is brought together, as a rule, by a special line of suture, and we know the peritoneum heals rapidly, with the result you get healing of the external surface and a separation of the muscle on the interior of the uterus.

I believe that Sanger was right in his location of the incision in the uterus in the midline, in the intermediate segment of the uterus, and should not extend into the fundus or into the cervix, and if the incision is made at that point the bleeding is usually reduced to the minimum, as Dr. Sampson's pictures of injection of the uterine circulation show an anemic area in the midline. There will be very little bleeding even when the placenta presents at the site of the incision. If the suture is made as the uterine muscle retracts, there will be tightening of the sutures and not relaxation with arrest of hemorrhage and separation of the muscle layers.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—I must confess I could not follow all of Dr. Davis' conclusions. I think that is partly due to the fact that some of his sections were so thick that they obscured all detail of structure, so I shall not discuss that phase of the paper except as it applies to the last case. As I understood it, Dr. Davis stated that the placenta showed histologic evidence of the existence of toxemia. From my experience I should not say that it does, as I am not acquainted with any characteristic placental lesions in this condition. Furthermore, I would say that the lesions described by him were such as may occur in any placenta and are not necessarily associated with toxemia.

The matter of the cesarean scar is one in which I have been much interested for a number of years.

Within the past few months Dr. Thomas O. Gamble, of Albany, and who was formerly on my staff, published all of our material, comprising 23 uteri which had been removed at the second or third cesarean section, and his findings were similar to those of Dr. Studdiford. In the majority of cases of rupture the accident is due to an imperfect scar, and in many cases one can get a clear history of infection following the original section. There is no doubt that the secret of preventing rupture lies in suturing the uterine incision correctly, and I agree with Dr. Studdiford that the higher up you go the greater danger there is for the woman. I make my incision below the umbilicus, and suture the uterus in two layers. The first, which consists of interrupted sutures, takes in the greater part of the uterine muscle, but does not come to the peritoneal surface. After the knots are tied and cut, they are buried by means of a continuous suture which brings together the superficial layer of muscle and the peritoneum. Our results have been very satisfactory indeed, as we have had only a single rupture in over fifty pregnancies following previous sections, and that occurred in a woman who was profoundly infected at the first section.

Apparently the bleeding is no greater when the placenta is inserted anteriorly, and the results in subsequent pregnancies are equally good.

DR. RUDOLPH W. HOLMES, CHICAGO, ILLINOIS.—Many years ago a member of our Society reiterated the assertion that the danger of rupture entirely depended upon the man who made the suture primarily. I did a section on a woman who later had a spontaneous labor. About a year after this easy labor she was brought to the hospital moribund. She died before operation. She was at term, in labor, with a rupture which occurred in the tissues directly contiguous to the scar, the latter being trabeculated. I believe, even a mild infection may be responsible for such an accident, but, catgut which has not been adequately hardened may be equally responsible; also, stitches which are tied too tightly may cause an anemia of the tissues which degenerates them, and may be the cause of the rupture just beyond the scar. I have done 11 repeated sections, and one was a repeated section on a woman done elsewhere. There were 24 children born by sections, namely, two had three sections. All had perfect scars. In one there was no vestige of the old scar. In another it was hardly visible. The rest had a roughening of the peritoneum which determined the location of the old incision. In all the integrity of the entire thickness of muscle was perfect. I have been given to understand that one of my patients was later delivered by forceps, and the uterine cavity palpated, which showed the presence of a crease on the mucous surface.

Rupture, I believe, is due to an infection, mild though it may be, during the cesarean convalescence. Secondly, an important item is that the stitches shall not be too tightly tied. Thirdly, the catgut should be 20-40 day chromic gut, otherwise absorption will be too rapid. Finally, the sutures should be so applied that there are no dead spaces. It is a mistake to employ continuous sutures, for the suture will loosen during the time of retraction of the uterus.

DR. DAVIS (closing).—I fully agree with Dr. Studdiford concerning the high incision. I did not take up the incision through the lower uterine segment, because, so far as I know, we have not as yet sufficient data to determine the frequency of rupture. I have operated on cases that had been operated on by incision through the lower uterine segment. In two cases there were many and dense adhesions existing between the contiguous tissues and the uterus.

It is interesting to note that one operator recommends making a transverse incision across the lower segment, and the two flap operation is the most recent effort to avoid rupture of the scar and to limit the spread of infection.

There is no question that the incision in the uterus should be, as Dr. Studdiford has said, in the center and never near the fundus. I prefer to examine the entire uterus carefully before making an incision and I extend the incision with reference to the contour of the uterus, always avoiding the upper portion. In suturing the cesarean uterus we should wait for retraction, and not suture the uterus during the initial and very active period of contraction of the uterine muscle. That I think is a very important thing to remember.

Whether we shall have no ruptures if we continue to operate through the lower segment by the extraperitoneal operation or not, we do not know as yet, and Säger was right in selecting the incision neither above nor below but through the middle of the uterus.

As regards Dr. Holmes' remarks concerning the use of catgut, the percentage of ruptures after the use of catgut is decidedly higher than by any other suture material.

The slides I have exhibited showed the character of the changes in the uterine muscle very distinctly in cases where complete recovery, with subsequent spontaneous labor had followed cesarean section; and also degenerative changes in the muscle which led to rupture.

DR. ALFRED B. SPALDING, of San Francisco, Calif., read a paper entitled **The Extent of Renal Lesions in the Toxemias of Pregnancy.** (For original article see p. 350.)

DISCUSSION

DR. JENNINGS C. LITZENBERG, MINNEAPOLIS, MINNESOTA.—I have been very much interested in Dr. Spalding's paper because we are carrying on similar investigations in the University of Minnesota at the present time with another renal test, but as yet are unable to give the final conclusions.

We have all been disappointed to find women with toxemia whom we have delivered, as we thought, at the proper time in order to save their kidneys, and yet those women are left with permanently damaged organs. I have thought for some time, with the rest of you no doubt, that it is not our sole duty to deliver a woman alive and put into her arms a living baby, but that it is our duty as well to restore her to her family and to the community in complete health. We see many cases that we thought we had given the best of care whose kidneys did not clear up, and who did not have a chronic kidney condition before delivery. Therefore, with this object in view, we have been carrying on our studies, but we have not gone as far as Dr. Spalding has.

I am impressed with his paper from two standpoints, one of which is his careful work, and the splendid cooperative work with the biochemist. His method, I believe, was developed by Dr. Addis. The method we use was developed by Professor Kingsbury, a professor of biochemistry in the University of Minnesota. The first reports on the test were made by Kingsbury and Swansen in the *Journal of Biochemistry* of last year. His test, like the one used by Dr. Spalding, is a real physiological test, and not simply a test of permeability of the kidney acting as a strain for dye. The urea in the urine is produced by the physiological biochemical processes of the body; therefore, it is a good test, because it is a true test of physiological function. As Dr. Kingsbury has pointed out, the test consists of giving sodium benzoate which is excreted as hippuric acid, and is recovered in the urine. In normal cases there is 80, 90 and even 100 per cent of a return of the sodium benzoate in the form of hippuric acid.

Kingsbury and Swansen in their work have apparently established the fact that this test detects earlier than phenolsulphonephthalein any reduction of kidney function and, also, that it is more constant. When the value of all these kidney tests is worked out, along with the test Dr. Spalding has given, perhaps we will be able to tell a little more accurately when the kidney is being damaged to an extent that renders it dangerous to permit pregnancy to continue. If we can add anything that will make our judgment more accurate so that we can say in this or that case it is dangerous to let this woman go further because she is apt to have a permanently damaged kidney, it will be a great advance. If this test Dr. Spalding is working out, or the Kingsbury test, or the phthalein test taken together can tell us something which will enable us to judge more accurately how much the kidney has been damaged, or is in danger of being permanently damaged, all of the work done by the biochemists and the painstaking work of Dr. Spalding in these cases will certainly be worth while, and it will have the additional value, which Dr. Spalding has emphasized, namely, the method of following these cases after delivery until the kidney has been restored to normal.

This work of Dr. Spalding's should be carried out to its conclusion, because if we can get a real renal functional test which will help us to more accurately estimate when the kidney has been damaged to the point that it is unsafe to let the woman go further, we will have progressed very far in caring for our toxic cases.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—We know little or nothing about toxemia and eclampsia. I know less today than I thought I knew twenty-five years ago. What we are going to get from the tests described I cannot tell.

During the last few years we have been getting back for examination a year after labor all patients delivered in the service, and at that time we have found that all patients who had frank eclampsia were, without exception, normal in every respect as regards urine, blood pressure, eye grounds, and everything else. On the other hand, in a considerable proportion of the women, who did not have eclampsia, but whose condition was diagnosed as preeclamptic toxemia, we have found chronic nephritis at the end of the year.

What do such facts mean? We ordinarily regard preeclamptic toxemia as a forerunner of eclampsia, and consider the latter as the acme of the toxemia. But at the end of the year we find the eclamptic women are all right, while those who suffered from what we considered its forerunner or precursor are all wrong. Consequently it looks as if we may be dealing with two quite different conditions. Whether I am correct or not, time can only show. We have studied about 100 of these patients, but I cannot give you the exact figures at this time, but does it mean that so-called preeclamptic toxemia has no connection with eclampsia, and that the former really represents a renal lesion which may eventuate in chronic nephritis, while the latter is a true toxemia?

Dr. Spalding's figures may give us some information along such lines. In many of his patients the urea output was well below normal, but, of course, only two of them had been followed sufficiently long after delivery, and they do not prove anything along the line I have indicated. I have an idea that when we get through with our studies that we shall find that preeclamptic toxemia, if let alone, might cause death, but would never eventuate in eclampsia.

DR. ARTHUR H. MORSE, NEW HAVEN, CONNECTICUT.—The method upon which Dr. Spalding's test is based was suggested by Addis and Watanbee. These investigators found that in the case of urea there was a loose relation between the rate of excretion and the concentration in the blood, namely, the higher the level of concentration of urea in the blood, the greater in general was the rate of urea excretion in the urine. They had noted also in other empirical observations on the effect on kidney function of removal of part of the kidney tissue, that the anatomical defect had a notable influence upon the function only if the remaining renal structure was subjected to a demand for increased activity in urea excretion by the administration of preformed urea. In 1918, they sought to approximate more closely the conditions which obtain in disease by a comparison of the degree of anatomical defect resulting from action of uranium acetate on the kidney, and the degree to which the function of urea excretion was disturbed under conditions involving strain on the damaged kidney. They made use of uranium acetate because it produces easily demonstrable lesions varying, according to the amount administered and the susceptibility of the animal, from necrosis to fatty and granular degeneration and because, except in large doses, it appreciably injures only the proximal convoluted tubule. Since urea is found in relatively large amounts in the cells of the convoluted tubule and as the quantity of urea is increased here during urea excretion, it appears that the cells of the tubes have a great deal to do with the concentration of urea from the blood. Therefore the lesions of the kidney which were produced by the administration of uranium acetate occurred in the parts essential in the excretion of urea. By varying the amounts of uranium administered, they were able to produce severe, mild and slight anatomical lesions. They then attempted to correlate the pathological changes in the renal structure with the

changes in urea excretion. This was done by giving uranium acetate in order to produce lesions in the convoluted tubules and then by giving preformed urea by mouth and determining the ratio between the urea concentration in the blood and the urea content of the urine. It was found that the classification made according to the ratio between the urea content of the urine and of the blood disagreed with the anatomical classification in only two instances.

Dr. Spalding's paper takes up the question from a clinical standpoint. He has determined the excretion of urea in normal nonpregnant individuals during pregnancy, in women following delivery, and finally in women who have had toxemia, and has brought out the fact that in the latter the output of urea is decreased.

Now, if we accept the work of Addis and regard the cells of the convoluted tubules as the cells particularly concerned in the excretion of urea and, if we determine that subject to a toxemia the output of urea is decreased we are led to the conclusion advanced by Dr. Spalding that in these patients there is a permanent damage to the cells of the convoluted tubules. Of course, it is important that all these patients be followed carefully over a period of years.

The point mentioned by Dr. Litzenberg is of importance. The attitude of the biochemist frequently differs from that of the clinician. All these biochemical problems need for their solution the cooperation of the biochemist and the clinician. In other words, such investigations are so complex as to demand the individuality, the skill and the experience of several specialists.

DR. SPALDING (closing).—I would like to emphasize a point brought out by Dr. Litzenberg, namely, the value of working with the various departments, particularly with the medical department. By cooperation, we as obstetricians can help clinically to determine what the damage to the kidney is in the various toxemias of pregnancy.

With the test of Dr. Addis we have a method of measuring quantitatively the damage that exists in the kidney. We have records of some cases studied for more than two years which were not included in the charts of his paper, because they had chronic nephritis. The function in these cases has gone down from 60 to 55, and finally to 5 before they developed uremia. In one case we have the kidneys obtained at autopsy.

Dr. Williams remarks on the differences they found in the tests in the cases of eclampsia and in the preeclamptic toxemias. To me, that does not seem hard to explain because in the case of eclampsia, the toxin is not poisoning the kidney so much as some other part of the body, and the extrarenal damage produces the convulsions of eclampsia. In the preeclamptic toxemia, the toxin acts longer on the kidneys and does not always produce subjective symptoms.

We have not as yet studied patients who have become pregnant while suffering with chronic nephritis.

A study of 100 puerperal patients will cost a considerable amount of money, as fully one-half the material is lost because of the poor training of the nurse. She does not know quantitative methods. She is taught to report facts only approximately correct as to time, while in these tests the facts must be accurate. This loose teaching is wrong. Every patient is submitted to three tests and by averaging these three tests we can tell if something has gone wrong with the test of a patient. The patient must take from 750 c.c. to 1000 c.c. of water with 30 grams of urea in it. If the patient should vomit, it will disturb the test. Sometimes a nurse will give food to a patient because she gets hungry. The patient cannot have anything to eat from 6 o'clock one evening until noon time the next day. It is always a surprise to see how easily such an error committed in the ward is detected by the technician in the laboratory. The laboratory men have far more accurate ways of

determining deductions than we clinicians have in helping them to carry out intelligent tests.

DR. FRANK W. LYNCH, of San Francisco, Calif., read a paper entitled **Retroversions of the Uterus. A Statistical Study Based upon Fifteen Hundred Postpartum Records of the Woman's Clinic of University of California Hospital.** (For original article see p. 362.)

DISCUSSION

DR. CHANNING W. BARRETT, CHICAGO, ILLINOIS.—The paper has been most interesting and it has verified some of the things we have had definitely in mind and have furnished a few surprises. We are all glad to have this statistical showing to counter the statistics of Winter which have been so frequently quoted by those who claim that retrodisplacements of the uterus gave no symptoms. Winter shows in his statistics that only 12 per cent had retrodisplacements of the uterus. Of 36 cases out of 200, very few of those had symptoms, and of those that had symptoms all but four could be credited to something else besides the displacement. These statistics have been quoted by men who set aside the idea that retrodisplacement could cause symptoms. Now, we have statistics showing about 41 per cent in clinic and private patients have displacements, and that quite a large percentage of these show symptoms due to the displacement which can be relieved by correcting the displacement.

The fact that these displacements are so common after confinement and the further fact that they can be corrected much more easily, if treated early, should lead us to consider the factors in regard to supporting it. The factors in regard to the cause of the displacement after confinement should deal with the patients, so that fewer than 41 per cent would have displacement, if possible. The very conditions that exist after confinement favor displacement, that is, a heavy organ, ligaments that have not involuted, as well as pelvic tissues that have not involuted, so that when a patient gets on her feet she is carrying a heavy uterus with long ligaments, and if the support from below is imperfect, there is all the more tendency for the organ to take a low position, and with a low position retrodisplacement may be favored.

I believe that the first six months after confinement is a very much more favorable time for correction of displacement than the latter six months of the first year. It would be advisable to make the correction as early as possible. One per cent of effort will gain then 10 per cent perhaps of results, while later, 10 per cent of effort will sometimes not gain 1 per cent of results.

The satisfactory thing about this work is that so many cases were cured and stayed cured after the removal of the pessary.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—I can only reiterate what the last speaker has said as to the debt the Society owes to Dr. Lynch for his very excellent statistical paper. No one, who has not seen Dr. Lynch's organization, can realize how he was able to present such a valuable contribution, because his organization is complete, and that has been shown by what he has been able to find. He has been his own severest critic by a 100 per cent follow-up. We are satisfied in New York if we have 25 per cent. The valuable thing to me Dr. Lynch has brought out is the late development of these displacements after delivery. Formerly, we were all satisfied and we thought we were making an advance in our former observations if we examined patients six weeks after delivery, and if a patient had no

complications at that time, that patient was considered all right. Dr. Lynch has brought to our notice the fact that in a great many cases these displacements only occurred four months after delivery, and a great number even later.

The last speaker (Dr. Barrett) has drawn attention to the fact that by recognizing these cases early, pessary treatment is all that is necessary in a very large percentage, 72 per cent. We know that ordinarily, if we take cases as they come to our office, if we get as much as 5 per cent permanent cures with pessaries, we are doing as much as we can expect. Here, taking these cases early, Dr. Lynch has shown us that we can get as much as 72 per cent cures.

I was a little disappointed in that Dr. Lynch had not attempted what to my mind is the simplest operation on the round ligament, and it is one which I have followed for over twenty years. It is the Ohlshausen procedure, somewhat modified, and that is, passing two sutures around the ligament, the first one quite close to the horn of the uterus practically where the ligament is inserted into the uterus, and the other one a little bit farther out. That attaches the strongest part of the ligament and it is a simple procedure. I have seen a great many of the operations done on the round ligaments, and I have been surprised at the amount of surgery that was done when the same anatomic results could be achieved in so simple a manner and with so little traumatism.

I can only speak definitely of the results in my private cases for the past fifteen years and I have had 124 cases of suspension by the round ligaments in this manner; 30 of these patients afterward became pregnant; three had two children, one had three, and there was one abortion at four months. I was able to observe these cases after delivery, and in every instance the uterus remained forward.

DR. WILLIAM E. STUDDIFORD, NEW YORK CITY.—We have been making investigations along the same lines that Dr. Lynch has indicated, and have found just as he did that with the question of retroversion, or displacement, occurring following operative deliveries and forceps and normal deliveries there was little difference. Our conclusions are about the same regarding the use of the pessary.

There are two or three other factors in the condition that I feel are of great importance. First, the question of a properly adjusted corset or abdominal binder. Many of these cases of retroversion have markedly relaxed abdomens, and one reason that we have fewer cases in private patients is the fact that they are able to buy suitable clothing, so that the abdominal support is better. We find in many working women that they either wear no corset at all, or their clothing is supported around the waist with a constant drag on the abdominal walls which tends to increase the retroversion.

One other factor of importance is the question of focal infection. In many of these cases the condition of the teeth is a factor in causing a certain amount of relaxation and a part of the general effect of the infection on all their muscles. Another condition that is of some importance is the condition of the cervix. You find in many of these cases six weeks or a month after delivery there is more or less erosion of the cervix, with some involvement of the glands of the cervix which leads to probably a mild focal infection at that location, and that probably has an effect on the ligaments that Dr. Williams has mentioned as a supporting factor. We have found in many of these cases, if we treat the condition of the cervix and improve that, the tendency to retroversion is lessened.

Another point: These cases which are relieved temporarily by a pessary, but not cured, form the ideal cases for the Alexander operation. That operation by shortening the round ligaments through the canal brings up certain fascial attachments connected with the round ligament that tend to lift the bladder and the anterior layer of the broad ligament, and will correct some of the varicosities that

occur in the broad ligament, and will do it in a way that no other operation of which I know will accomplish. Some of the most satisfactory results I have ever seen are in those cases of this type in which the Alexander operation has been done.

DR. JOSEPH BRETTAUER, NEW YORK CITY.—I should like to endorse Dr. Studdiford's remarks regarding the Alexander operation. In my hands it has proved absolutely satisfactory and is easily performed. Very rarely was it necessary to resort to some other method on account of too thin ligaments or too great difficulty in isolating them.

Furthermore, I believe that Dr. Williams has struck the keynote of the situation. The etiology of postpartum retroflexion has nothing to do with the ligaments; the cause is the uterine wall itself and a proper postpartum management of the patient will decrease to a large extent the occurrence of this condition. By this I mean the careful management of the bladder and the discarding of the tight abdominal binder, which private patients regard as such an important feature immediately after delivery.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—The statistics of Dr. Lynch bear out to a great extent my own. My attention was first directed to this subject a number of years ago when I found my private patients presented more retroflexions than ward patients. When I came to analyze the reasons I found that the private patients were examined 6 weeks after labor, whereas the ward patients were examined two weeks after labor, and when we got the ward patients six weeks after labor they presented approximately the same incidence. It therefore, appears that retroversion develops somewhere between the second and sixth week. Without giving accurate statistics at this time, I may say that at least one-third of our women develop a retrodisplacement of some kind.

What Dr. Lynch says about the pessary is quite correct, and I should say it will cure the condition in 75 per cent of the cases. In many cases in our material we did not need a pessary; as all that was necessary was to replace the retroverted uterus manually at the end of six weeks, have the patient return in a week, when it was found that in quite one-half of the cases the uterus remains forward. When this is not the case a pessary is needed.

One important factor which has impressed me is that such conditions should be treated as early as possible. When we get the women back at the end of a year to check our findings, we find that when a good result has been attained at the end of six weeks, it is maintained at the end of the year.

I do not believe that retroflexion is due to a relaxation of the ordinary uterine ligaments. I take it, the cause lies in undue distention of the tissues at the base of the broad ligaments, the so-called ligamentum transversale colli, which are spread apart by the act of labor and have not retracted sufficiently when the woman begins to go about to support the large uterus, when displacement occurs. If the uterus is put forward in such cases, retraction takes place in the normal way and *restitutio ad integrum* usually results.

What we need to work out in puerperal cases is the status of affairs at the base of the broad ligament. This means that when such women die, we must get their bodies and make frozen sections, which may give us an insight into the state of affairs in the pelvic floor and at the base of the broad ligament. We hope within a reasonable time to report some work on this subject, which may be more or less conclusive.

DR. G. BROWN MILLER, WASHINGTON, D. C.—I am sorry Dr. Lynch did not use the word retrodisplacement instead of retroversion for one or two reasons. I have been following very carefully for a number of years my private obstetrical

cases and found a few years ago 25 per cent of them had retrodisplacement following labor. I think common sense will teach us that the most important factors in retrodisplacement after labor are the same as those in a retrodisplacement or retroversion in a relaxed vaginal outlet and a laceration, where the uterus gets lower and lower, falls over backward and tends to come out.

I agree with Dr. Channing Barrett that lengthening of the ligaments, especially the round ligament, and relaxation of the support at the floor of the pelvis are the two main things that cause retrodisplacement following labor.

I have had a certain number of cases which do not seem to bear out what Dr. Williams has said. In these cases the uterus has not remained in anteposition following replacement with a pessary. These are the cases in which there was retrodisplacement before pregnancy. In practically all these cases in my private work the uterus would not stay in antelexion or anteversion after the pessary had been removed. So the injury at the base of the broad ligament of which Dr. Williams spoke need have no bearing in such cases.

The reason a retrodisplacement occurs after the second week is apparent to me because before that time in the majority of cases the uterus is too large to be contained in the true pelvis. After it undergoes involution and gets smaller, it falls into retroversion.

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIFORNIA.—We have followed a small series of cases in the clinic along the same line, tracing them for about six months after delivery, and of 300 patients that were followed we have found practically the same as Dr. Lynch, an incidence of 44 per cent of retroversions. But in dividing this series into three groups according to age, one group from 18 to 28, another from 28 to 38, and a third from 38 to 48, some interesting things have been brought out, and among them we have found that the younger patients have the largest percentage of retroversions, and the older patients have the least number of retroversions. Why that is, we do not know.

In my private work I have for some time been interested in testing the influence of the kangaroo walk by asking every patient, before I examined her, have you taken up the kangaroo walk, or have you not? About 50 per cent of the patients we find have taken up the kangaroo walk, and these have had 50 per cent less retroversions. Some patients would say that they had forgotten what the kangaroo walk was. We tried to show them the kangaroo walk in the wards. We succeeded in having one patient walk down the ward, and all the other patients replaced their retroverted uteri by laughing.

In regard to the operative results of retroversions, after reviewing our entire series of replaced uteri by operation and studying every effect on future pregnancies, we have reached the conclusion that the best results have been those obtained by the Ohlshausen or Gilliam operation.

DR. J. WESLEY BOVEE, WASHINGTON, D. C.—We are losing sight of the congenital retrodisplacements of the uterus; we are not checking them up with this series, and therefore we cannot place too much reliance on crediting labor with the production of the retrodisplacement.

There are certain features about the puerperal treatment of these patients that seem to me of importance, and one is to get the patient off her back as soon as the third day after delivery, if possible; keep her on the abdomen largely; the uterus is small enough after three days to fall below the promontory of the sacrum. Before that it is not.

Another feature is to see that the bladder is kept empty. Women after delivery, as a rule, have retention of urine; the bladder becomes very much distended, and following the work of Dr. Curtis and Dr. Watkins I have made free use of the

catheter. My patients are catheterized every six hours with regularity, provided they have not voided before the six hours is up. By keeping the bladder empty strain is taken off the round ligaments.

I think Dr. Williams has given us a special point of value in the production of the retroversion. I do not see any advantage in pinning our faith so strongly to the round ligaments. We find, at times, the round ligaments are mere strings, like the ordinary sized string we tie a package up with, so what is to be gained in shortening that ligament? I think we will have to look elsewhere for support. It seems to me, we should attract attention to the lower pole of the long axis of the uterus and not the upper pole in retroversion of the uterus. Dr. Lynch said he found the uterosacrales were not attached to the sacrum. That is because the ligament was not in the operation probably sutured to the periosteum of the upper part of the first segment of the sacrum. If you will suture it to the periosteum, you are more apt to get good fixation posteriorly and get the cervix pulled backward.

DR. DOUGAL BISSELL, NEW YORK CITY.—I would like to emphasize several points that were brought out in this discussion, particularly that referred to by Dr. Williams, namely, the importance of the fascial structure surrounding the cervix. To my mind this is the chief supporting structure of the uterus.

The next point is that regarding the overdistention of the bladder; the importance of not allowing the bladder to become overdistended after labor should always be emphasized, and the bladder should be emptied every six hours after every retroversion operation. If the use of a catheter becomes necessary, there is no objection to it, provided it is used with surgical precautions. I think that most of the failures of operations for the correction of retroversion are due to the fact that the ligaments are overstretched by distention of the bladder within the first ten days after operation.

I have, among the exhibits at this meeting, a model or manikin made by me several years ago which was devised to demonstrate the action of the fascio-muscular structure in which the cervix is embedded; also the change in position of the corpus uteri when the bladder distends. When the rubber balloon, which is introduced into the cloth bag representing the bladder is inflated, the corpus will be seen to recede until it reaches the sacrum. Under these circumstances, the round and broad ligaments will be put on a stretch, and when the air is allowed to escape from the balloon, diminishing the size of the bladder, the corpus will be seen to move forward, as the result of the action of both these lateral ligaments and of the fascio-muscular diaphragm.

DR. WILLIAM C. DANFORTH, EVANSTON, ILLINOIS.—In going over the records of 250 private patients we found an incidence of puerperal retroversion of 20 per cent. These figures are given approximately and almost agree with those of Dr. Lynch. In every one of these in which examination early in pregnancy showed a retroversion, it recurred after delivery. I wonder if some of the cases which appeared in Dr. Lynch's series were not of the congenital type rather than caused by the pregnancy and labor.

With reference to pessary treatment immediately, that is, within six or eight weeks after confinement, we have gotten permanent results in 75 per cent, as shown by follow-up observation.

I believe the point brought out as to the position of the patient is important and for some years we have been routinely having our patients turn over and lie on the abdomen as soon as possible. We have also made use of the catheter in the manner suggested by Dr. Curtis.

With regard to the kangaroo walk, I tried it when Dr. Polak first suggested it,

but whether women in Chicago are less amenable to suggestion than they are in Brooklyn, I do not know. Many of our patients could not be induced to try it.

We have, however, had some successes with simple knee-chest posture, and simple postural methods have a definite value.

DR. GEORGE W. KOSMAK, NEW YORK CITY.—There is one feature not touched on by those who have discussed the paper, and that is the necessity of making repeated and late postpartum examinations. Many physicians are neglectful of this point. They dismiss private cases at the end of fourteen days and may not see them again until a succeeding pregnancy.

The production of a retroversion is not limited to two or three or four weeks after labor, and I have made it a point to examine all my private cases three months after labor, and even at the end of the third month changes are found which were not noticed at previous examinations.

Another point brought out by Dr. Studdiford is the question of proper procedures in cases of cervical laceration, or cervical erosion, so-called. I think it is very important to treat all these cases, otherwise there will be a resulting low grade pelvic infection, very often centered to the region of the culdesac. The presence of this infection in many cases precludes the use of the pessary. Even if you do get the uterus forward in these cases and insert a pessary, it causes a great deal of discomfort, because the head of the instrument presses against the inflamed area. It is much better to treat these cases by manual replacement, putting in a tampon and instructing the woman to assume the knee-chest position or "kangaroo walk."

DR. LYNCH (closing).—The discussion has covered many points of interest. Dr. Miller's criticism is quite justified since the paper deals with retrodisplacements. Our results in another series indicate that pressure on the bladder during labor is one of the great causes of prolapse. We were chiefly interested during the preparation of our paper in the etiology of retrodisplacements. We have come to the belief that congenital displacements may be more common than realized. We have utilized nearly all methods of treatment in attempting to prevent retroversions. Our puerperal cases are encouraged to move about in bed as soon as they are able after labor. On the second day they are turned on their face. As soon as they are out of bed, they are taught the knee-chest position, and later are urged to use the kangaroo or monkey walk.

The subinvolution cases are treated by replacement and pessary when the uterus is retroposed, and by ergot and tampons if the organ is forward. Our study convinces us that no one type of retrodisplacement operation can be used for all cases. We have been greatly interested in the reason for recurrences of the retroversion after operation. There is no doubt but that if the basal support of the uterus is good, a little restraining force suffices to hold the fundus in the forward position. This has been well shown by the success which attended the great majority of ventro-suspension operations. Yet the basal support is not always good and considerable check is usually necessary. Therefore, if the round ligament is not firmly fixed in the inguinal ring, it will gradually pull out and allow the fundus to fall backward, even if the fundal insertion of the round ligament is in its normal high position. If the fundal insertion of the round ligament is not high up on the fundus, but has slid down, as so often happens in chronic retroversions, no amount of forward traction will do else but bring the uterus forward en masse without causing flexion. We believe that failure to recognize these two points explains the majority of operative failures.

DR. EDWARD A. SCHUMANN, of Philadelphia, Pa., read a paper entitled **Observations on the Pathology and Treatment of Hydatidiform Mole.** (For original article see page 386.)

DISCUSSION

DR. J. WHITRIDGE WILLIAM, BALTIMORE, MARYLAND.—I would take issue with Dr. Schumann as to his radical treatment. When he quotes me, all that I can say is that when one writes a book one gets into all sorts of trouble. I have forgotten the figures in my book, but I must have said what Dr. Schumann has quoted; in which event I wish to amend my statement. I have seen approximately twenty cases of hydatidiform mole, and only one of them was followed by chorioepithelioma. The uterus was removed, and the patient was well three years afterward.

There is no doubt of some relationship between hydatidiform mole and chorioepithelioma. A very instructive article has just appeared by Sunde in the *Acta Gynecologica Scandinavica*, in which, after analyzing the question carefully, he concludes, roughly speaking, that 50 per cent of chorioepitheliomata are preceded by moles, while only 5 per cent of moles are followed by chorioepithelioma. If that is the case, I do not think it is justifiable to sacrifice the uterus as a routine procedure except in women approaching the menopause. In the only case of chorioepithelioma following a mole, which I saw and followed up, strange to say, I advocated removing the uterus with the mole because the woman at that time was forty odd years of age and was not likely to have more children. She, however, elected to keep the uterus, but within three months she returned with chorioepithelioma. We removed the uterus and she was well three years later.

The high figures of Meyer concerning the incidence of hydatidiform mole, are wrong. Meyer based his diagnosis on myxomatous degeneration of the stroma of the chorionic villi; while most pathologists, following the lead of Marchand, lay stress upon the proliferation of the chorionic epithelium. In most of Meyer's cases the former, but not the latter, condition was present, and therefore my opinion is that what he described was a degeneration following the death of the embryo and not a new growth.

The specimens which Dr. Schumann has shown are not altogether convincing to me, because if you take sections through the placental site in any uterus (normal pregnancy or mole), in most instances, an invasion of syncytium away down in the uterine muscle will be noted, and I do not think in several of his specimens there was more infiltration than I have seen in many normal uteri removed at cesarean section.

To summarize, I think that Dr. Schumann's attitude is a little too extreme, and that the figures quoted in my book exaggerate the seriousness of the condition. Men do report abnormal cases, but not normal ones, so that we have gotten in this way a totally erroneous impression of the dangers associated with moles. Sunde, to whom I have alluded, got his statistics by correspondence with the clinics in Scandinavia, finding out which of the patients had hydatidiform mole, and following them for five or more years, with the net results that only 5 per cent of them developed chorioepithelioma.

The other dangers of the mole are in great part due to faulty technic and can be largely avoided. I saw recently a specimen which was of the greatest interest in this connection. An assistant in the pathologic department of the University of California kindly sent me a specimen a few weeks ago which represented the uterus and appendages removed for hemorrhage some time after the extrusion of a hydatidiform mole. Away out in the broad ligaments as far as the ovary, the vessels were distended by vesicular villi, which could be seen with the naked eye. Under

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DISCUSSION

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the microscope it could be seen that in certain places the chorionic epithelium was invading the walls of the vessels. In this instance the patient was well fifteen months after the panhysterectomy. It was an extraordinary case, particularly as it showed the extent to which a growth can extend without causing a fatal issue.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—I have been interested in the subject presented by Dr. Schumann for a number of years and desire to mention a few clinical points which the doctor left out and to draw attention to the frequency with which cystic degeneration of the ovaries occurs with hydatidiform moles. Fränkel has collected 100 cases and he claims in the majority the stroma is not involved and retrogression will occur. In my own experience I have had two cases, one in which both ovaries were the size of one's closed fist. After removal of the hydatidiform mole, I had the patient in the hospital for two or three weeks and then I had to remove both ovaries.

I desire to mention also the frequency with which nephritis and albuminuria occur in cases of hydatidiform mole, 20 per cent, yet at the same time, it is rare to have eclampsia develop, chiefly due to hydatidiform mole occurring early and eclampsia late in gestation.

I have had two cases of eclampsia and hydatidiform mole, one in a young woman of twenty-five and in another one at eighteen. In one of these cases, some thirteen years ago by accident I learned the value of employing hysterotomy to empty the uterus of the mole. The patient was five months pregnant; she had a severe eclampsia, and I emptied the uterus through a hysterotomy from below. I opened the uterus, and to my great surprise I found nothing but the hydatidiform mole. I put in my hand, emptied the uterus completely, and was able to palpate the whole interior of the uterus with my hand. Since then, knowing by my experience before, that in emptying the uterus through the cervix in the ordinary way, there was considerable hemorrhage and uncertainty in getting the uterus completely emptied, I have made it a rule to do a vaginal hysterotomy in every case for the purpose of being sure to empty the uterus of all the vesicles, and at the same time being able to palpate the interior of the organ; in doing so if one finds a hard nodule, one may assume he is dealing with a chorioepithelioma. In one of my nine cases of chorioepithelioma, the diagnosis was made in that way. I then and there removed the uterus through the vagina. Microscopic examination afterward confirmed the diagnosis of chorioepithelioma.

I take the same position as Dr. Williams in these cases, i. e., that it would be entirely too radical to operate and remove the uterus in every case of hydatidiform mole. We see in our hospital practice four or five cases of hydatidiform mole each year, and apart from those that subsequently developed chorioepithelioma, the simple removal of the mole was sufficient. I am surprised at the figures given here as to the fatalities of this condition.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—There is doubtless a great difference between the malignancy of the syncytial and Langhans' cells. Ever since Marchand's early work on the classification of chorioepithelioma, many have attempted to correlate the malignancy of the tumor with the histologic pictures of its cells. None, however, have done more than von Velits and Schmauch more than seventeen years ago when they insisted that the Langhans cells were the important cells in determining the degree of malignancy of the tumor. More recently, Ewing has also emphasized the fact that the syncytioma and a syncytial endometritis are not as malignant as choriocarcinoma. Therefore, in the type of case under discussion, we should be greatly interested in the character of the fetal cells found in the uterus underlying the placenta. Most of these appear to be syncytium.

Of course, it is perfectly reasonable to claim that chorioepithelioma usually de-

velops from differentiated fetal ectoderm since the majority of cases develop in early pregnancy when there are two layers of fetal ectoderm. More than 20 per cent of the 455 cases of chorioepithelioma collected by Pollosson and Violet followed pregnancy at full term. If the tumor had originated at this time late in pregnancy, it could have developed only from syncytial cells if the tumor originated in the chorion, since at this time the Langhans cells have disappeared.

We have recently seen a case of chorioepithelioma in a woman of 54, who never had a miscarriage or a hydatidiform mole. She had 15 children at full term, the last of which was born fifteen years ago. She had been in the menopause for four years.

DR. BENJAMIN P. WATSON, TORONTO, CANADA.—My experience will bear out what has been said in the discussion of this paper regarding possible malignancy following hydatidiform mole and the relationship of chorioepithelioma malignum to hydatidiform mole. We have seen in the last eight years 17 cases of hydatidiform mole. These patients have been followed, with no fatality in any case. The moles were evacuated through the cervix and in no instance had chorioepithelioma malignum followed. Of three cases of chorioepithelioma malignum, in only one of these was there an antecedent mole found. I have felt the danger of this condition has been very much exaggerated simply because a very large number of cases of hydatidiform mole that have terminated favorably have not been reported in the literature, and we have a totally erroneous idea as to the seriousness of this condition.

I feel as do others in the discussion, that routine hysterectomy for hydatidiform mole is too radical a procedure. The last two cases of hydatidiform mole I have seen within the past three months were both in young women who were pregnant for the first time. We should try to clear out the uterus promptly in these cases. I dilate the cervix and with a small open forceps evacuate the mole through the center of the mass, keeping the hand on the uterus, getting the mass reduced until I can introduce the finger or curette. If that is done carefully, there is no risk of perforation, and sepsis should be avoided. If the patient is kept under observation for the next two years and curettage is done immediately after any irregular hemorrhage, chorioepithelioma malignum can be detected at an early stage.

DR. E. E. MONTGOMERY, PHILADELPHIA.—I have seen two or three patients with hydatidiform moles similar to the ones described, who were not subjected to operation. One of these, whom I saw twenty years ago is still living and in good health. I have operated on several patients for chorioepithelioma and in none had the condition been preceded by hydatidiform mole.

DR. HIRAM N. VINEBERG.—In my nine cases of chorioepithelioma, four were preceded by hydatidiform mole.

DR. THOMAS J. WATKINS, CHICAGO.—Hydatidiform moles unquestionably are not as dangerous of becoming malignant as has been generally assumed. I would suggest as a prophylactic measure the introduction of radium into the cavity of the body of the uterus after removal of a mole, as the cells are of a variety that are especially susceptible to radiation.

DR. EMIL NOVAK, BALTIMORE, MARYLAND.—Dr. Williams has already called attention to the recent investigations of Meyer on this subject. His figures as to the incidence of hydatidiform mole were quite striking. He believes that the ordinary hydatidiform mole described in the literature, corresponding to the type described by Dr. Schumann, represents merely the end product of a process which, in its early stages, is commonly overlooked. This undeveloped variety of hydatidiform degeneration Meyer believes is the cause of a large number of early and other-

wise unexplainable abortions. He lays great stress upon the stromal and blood vessel changes which occur in connection with these early forms of hydatidiform degeneration. I have studied the material obtained from a large number of cases of incomplete abortion, and, like Dr. Williams, I have not been able to convince myself of the identity of the degenerative changes described by Meyer with genuine hydatidiform mole. On the other hand, in cases of tubal pregnancy, I have encountered a number of sections which, microscopically at least, I could not distinguish from hydatidiform mole. On the whole, Meyer's study is extremely suggestive, although he cannot be considered to have proved his point as yet. The important desideratum is the demonstration of transition stages between the early changes described by him and the changes characteristic of the fully developed variety of mole with which we are all familiar.

One point brought out by Meyer, with which I have likewise been much impressed, is the relatively slight degree of trophoblastic change observed in many moles. Some of our own sections show a practically normal trophoblast, even though the villi are tremendously hydropic.

With regard to the frequency with which malignancy develops in these cases, I am convinced that this is much less than has been commonly asserted. Of eight cases which I have recently studied, all are living and well after simple evacuation of the uterus. The proper procedure with hydatidiform mole is to evacuate the uterus thoroughly, and then to keep the patient under observation for a period of months. If bleeding persists or recurs, it is probably best to perform hysterectomy. Even then, in a certain number of cases, the disease will prove to have been non-malignant. There is no field in which mistakes are more easily made than in this. To illustrate, some years ago, within a short period of time, five uteri were sent to Dr. Cullen's laboratory, all said to have been removed for chorioepithelioma. Of the five, only one proved to be actually the seat of this disease, the others showing perfectly benign conditions associated with normal pregnancy. It is usually said that about 50 per cent of all chorioepitheliomata follow hydatidiform mole. There is no reason to believe that this proportion is overestimated. On the other hand, I am convinced that it is an exaggeration to say that 10 per cent, or even 5 per cent of hydatidiform moles are followed by chorioepithelioma. Some authors, like Findley, put the proportion as high as 25 per cent. Of course, if future work shows that hydatidiform mole is, as Gierse and Meyer believe, exceedingly common, the proportion of cases in which malignancy occurs will drop far below the present estimate,—to one or two, or even a fraction of one per cent.

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIFORNIA.—Two years ago my associate, Dr. Stevenson, treated a patient with very marked chorioepithelioma, with invasion of the wall, whose hemoglobin had been reduced to over 30 per cent, and who was in such a precarious condition that even curettage was not thoroughly done. He treated the patient with radium, using 100 milligrams, which was followed by complete restoration of the uterus to its normal condition, and the patient has remained well since.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—I have recently treated with radium a case of chorioepithelioma, which had been having symptoms for two months. She did not seem to be a good operative risk, so we gave her about 3500 millicurie hours of radium, by leaving 175 millicuries of radium emanation in the uterine cavity for twenty-four hours. We were compelled to do a hysterectomy eight weeks later, because the symptoms persisted. This case was a typical choriocarcinoma. Dr. Stevenson's case, which Dr. Spalding mentions, was a syneytioma, a mass composed chiefly of syncytial cells.

DR. SCHUMANN (closing).—We must take published figures at face value. Therefore, when Dr. Williams states in his textbook that the mortality following hydatidiform mole is 20 per cent, it must be assumed that these figures are accurate. Further, when Findley's analysis of 500 cases reveals a total mortality of something over 20 per cent, I must take these figures as definite. It follows then, that as far as we know the mortality of hydatidiform mole is entirely too high.

I do not advocate hysterectomy for every case of hydatidiform mole, but do insist that the tumor be studied *in situ*, by abdominal hysterotomy, and that it be shelled out under the eye, if possible, and the uterus closed. But when the myometrium is seen to be the seat of small hemorrhages, and when invasion of its structure is deep and extensive, then hysterectomy is the procedure of choice. The blind curettage and packing advocated by Dr. Watson, belongs in my opinion, to a bygone age of surgery and is entirely out of place today.

From the tenor of the discussion it would seem that cases of hydatidiform mole are not usually regarded as serious. In my experience this type of case is frequently a desperate surgical risk, the patient infected and profoundly exsanguinated. I believe these women stand a far better chance for their lives by the proposed plan of hysterotomy, after blood transfusion, if necessary, than by curettage and packing.

DR. RICHARD R. SMITH, of Grand Rapids, Mich., read a paper entitled **Prolapse and Eversion of the Urinary Meatus in the Female with Special Reference to Surgical Cure.** (For original article see page 395.)

DISCUSSION

DR. GEORGE GRAY WARD, JR., NEW YORK CITY.—I have only seen one case of what I should classify as a complete eversion of the urethral mucosa. We see cases of moderate eversion of the urethral mucosa, but the condition in which there is a real prolapsus, a turning inside out of the urethral mucosa, is rare in my experience.

In looking up the recent cases in the Woman's Hospital, I was able to find only four that I could classify under this heading. One was seen in the cystoscopic clinic in which there was a complete turning out of the urethral mucosa which was treated by fulguration. Two other cases were treated by operation. My case was rather extraordinary in that there was no preceding symptomatology which would lead one to expect such a condition. The woman was perfectly well, and suddenly, after straining at stool, was seized with an acute pain referable to the urethra. This had been going on for four or five days, and the mass was as large as the end of the thumb, very much swollen and intensely painful. It consisted, as was shown at operation, mostly of the posterior wall of the urethral mucosa, with about one-third of the anterior urethral wall. The patient was sixty years of age, had had no prolapse, no laceration and no pelvic floor injuries. It is difficult to understand how it occurred, except that she had a wide open external meatus.

I first tried palliative measures to reduce the swelling, but without any success. I removed the mass by amputation and dissecting out the urethral mucosa, so that I could draw the edges down and suture them to the margin of the vestibule. I was apprehensive about removing so much of the posterior urethral mucosa, thinking I might have some serious results, but it produced no discomfort at all. The tissues stretched out, she has perfect control, and has experienced no subsequent difficulty whatever.

DR. THOMAS J. WATKINS, CHICAGO.—I concur entirely in what Dr. Smith says. The etiology can be summed up as being due to increased mobility, infection and atrophy. The reason that caruncles appear generally after the menopause is because the atrophy affects the vaginal more than the urethral mucosa.

Increased mobilization can be rectified by suture or by the introduction of needles of radium between the vaginal and urethral mucosa, the choice of treatment depending upon the variety of increased mobilization. Where the entire urethral body is displaced, it should be fixed by sutures, which will replace it in its normal position and give it a condition of relative fixation. Satisfactory results can only be obtained in some cases by seeing to it that the bladder wall is sufficiently elevated.

In cases of prolapse of the mucous membrane, which has somewhat the appearance of a rectal prolapse, I would advise a modified "Emmet button-hole" operation. An incision is made through the vaginal mucosa down to the body of the uterus. The urethral body is then grasped with tissue forceps, retracted so as to overcome the prolapse, and fixed by firm sutures. This, I believe, accomplishes the desired result without opening the urethra.

DR. HERMANN J. BOLDT, NEW YORK CITY.—I was particularly interested in the case reported by Dr. Ward. I believe if Dr. Ward will examine the history of his patient carefully, he will probably find in that particular instance the etiological factor was due to atrophy of the vulva and vagina, which is also participated in by the muscularis and submucosa of the urethra, and we have them as a result, the mucosa protruding. We get practically eversion of the mucosa. When these cases are of long duration and when they occur slowly and when the protrusion is not large, they seldom give rise to serious symptoms. In the acute conditions the mucosal tumor when it protrudes from the urethral opening, resembles frequently a succulent raspberry in appearance and signs. It gives trouble and pain, and, if not reduced, we have circulatory changes; not infrequently at the base, gangrene or necrosis occurs.

Straining at defecation, in all probability, is correctly interpreted by Dr. Ward as a factor.

I do not believe any of us can have a large experience with this class of patients, because during the period of from 20 to 45 years they occur seldom, and when they do occur, it is the result of traumatism in labor, protracted labor, pressure on the urethra, all causing more or less traumatism of the muscularis. Then partial separation of the mucosa occurs, and we may have a partial descensus or diverticulum forming or a circular prolapse.

With regard to the treatment, I can add nothing except to endorse what Dr. Watkins has said. I believe that is the most rational method, and the only one that ought to be pursued. It is far superior to the button-hole operation devised by Emmett.

But there is one method not spoken of, that devised by Fritsch years ago; namely, the introduction of a Nelaton catheter into the urethra and applying a silk ligature around the catheter. In the course of two or three days adhesions take place between the mucosa and the meatus, and complete restoration occurs. There is absolutely no risk and no blood lost. In the majority of cases this method will yield good results.

With regard to direct surgical intervention, I should like to add a few words, namely, when excising the mucosa not to draw it down too much with the mouse-tooth forceps. One may excise more than is desirable, and the mucosa, after it has been excised, has a decided tendency to retract farther than desirable.

DR. CHANNING W. BARRETT, CHICAGO.—I have had two cases in children in which the urethra rolled out. In one the urethra was followed by a small portion of the bladder. This was replaced before I saw the case. I did not believe so much tissue could come out with the condition found when it was reduced. By having the patient strain at stool or urination, this could be brought out again, and yet it would go back easily. The child was quite young. The treatment required in that case was to prevent the child from straining at stool. In instructing the patient to lie down for urination it made a great fuss, but when it would urinate the mother would keep up the support. No surgical procedure was adopted in this case. I have seen one case where the urethral prolapse came out acutely and was about the size of a dime. A certain degree of prolapse is very common in traumatism. We see plenty of cases where there is traumatism of the outlet in the urethra; there is a mobility of from one and a half to three inches. In this instance, instead of doing the vesicocele operation, we carry the incisions down to the vestibule and along upside the urethra. Much of the circumference of the urethra is taken away, making the opening smaller. Sometimes the upper stitch that closes it is caught in the lower end of the urethra, without an incision running up the urethra, but in other cases it is so extensive and the urethra is so patulous, a V-shaped section is taken out quite a distance from the urethra and closed. I am glad to say, I have found no case in which I found it necessary to do a pathologic interposition operation to cure this prolapse of the bladder and urethra.

DR. DOUGAL BISSELL, NEW YORK CITY.—My experience in this particular phase of surgery has been limited to three cases. They were of several years' standing, in women over forty years of age. One of these cases was successfully treated by fulguration.

The first case showed a large protrusion of the mucous membrane of the urethra. I operated very much the same way as I do the Whitehead operation for the removal of extensive hemorrhoids. A cone shaped section of the urethra, about one-third of its approximal portion was made. The mucous membrane of the urethra was anchored with silk at four points equally separated, to the mucous membrane of the vagina; then a continuous line of suture, No. 0 catgut, adjusted the cut edges of the mucosa around the entire urethral orifice. The piece of tissue removed in this first case, was sent to a pathologist, and he termed it "hemorrhoid of the urethra". It was the first time that I had heard the term hemorrhoid applied.

The third case was the one referred to by Dr. Ward. She was sent to me by a physician with a diagnosis of "a malignant growth of the urethra." The protrusion of the mucous membrane through the meatus was very marked, but showed no signs of malignancy. A cancer was found, however, in the vault of the vagina. This case was subjected to radium treatment, after which I operated for a prolapsed urethra.

DR. SMITH (closing).—I think the cases of marked eversion of the urethral mucosa are very rare, but those of lesser degrees, the small ones, are very common and often produce symptoms. When they do they should be corrected, and that can be determined by the history given by the patient and by the presence of tender areas about the meatus.

NEW YORK OBSTETRICAL SOCIETY

MEETING OF APRIL 11, 1922

(Continued from page 190.)

DR. I. KROSS (by invitation) read a paper on **Degeneration of the Ovaries after Hysterectomy; an Experimental Study.** (For original paper, see page 408.)

DISCUSSION

DR. J. O. POLAK.—The pendulum has swung twice in my clinic from conservatism to ablation and now it has swung back to conservatism and, notwithstanding the conclusions of the essayist, I am convinced, from a recent study which we are preparing, that the menopausal symptoms are not as severe where the ovaries are conserved as where they are removed. We have just reviewed about 360 cases of fibroids and are studying the blood pressure in these cases where the ovaries have been left and the ovaries have been removed, excluding the cases that had hypertension prior to operation, and it is very interesting to note the effect of the removal of the organ and the disorganization that takes place in the interglandular relations by the removal of these organs, on the pressures, and, clinically, I am more and more convinced that patients are better off, even for the few years or few months that the ovary retains its function.

I do not believe that we can always make our deductions from experimental studies on animals.

I question the fact whether the circulation cannot be conserved better than the doctor has spoken of. I am sure that in a certain number of these cases where hysterectomy has been done that the circulation can be conserved to a greater or less extent in the ovary, particularly when the tube is retained. Certainly clinically in the last few years our experience has been that the patients are more comfortable and that they have fewer menopausal symptoms when the ovary is conserved.

DR. H. N. VINEBERG.—In reference to the subject of conserving the ovaries and in being able to do the operation in such a way that the blood supply from the uterus can be retained, I would say that the subject has been very thoroughly investigated. It would be interesting to know why Dr. Polak doubts his former observations in connection with 300 cases. I think Dr. Polak attaches too much importance to blood pressure. We do not know enough about blood pressure to attach enough importance to it as to be able to say whether a certain procedure is advisable or not. I am told by the internists that the change of pressure of patients in their office will vary from 10 to 20 millimeters while they are being examined.

DR. HAROLD BAILEY.—Several years ago I had some experience in studying the metabolism of dogs following the removal of the ovary and, to hark back to the early results of 1899, Hugo Lüthje found no difference in metabolism after the operation. Loewy and Richter then in three or four dogs discovered a considerable difference. Their work was a great aid to those who believed in conservatism. Dr. Murlin and I worked on two animals but our work was interrupted by the war and was never continued. As a result of our study for a

period of three months on these animals we were not willing to commit ourselves, but the actual findings, with all deductions, indicated a reduction in metabolism of 6 per cent in one animal and in the other of 12 per cent, and if we did not make deductions the difference in metabolism would have been somewhere between 12 and 15 per cent. Now this apparently favors conservation.

DR. TAYLOR.—There is another point that has not been brought out in this question of conservation of the ovaries. While it is probably true that the ovaries if retained will lessen the symptoms of the artificial menopause there is a decided risk of degenerative changes in the ovaries with definite pain and physical discomfort. While the vasomotor disturbances of the menopause may be more severe if the ovaries are removed there is less danger of pain and physical discomfort.

DR. HERMANN GRAD.—There are two points that have not been touched upon in connection with this subject. First, we know very definitely that some women have disturbances with their menopause without any operation; on the other hand there are others who have very little disturbance. When one removes a uterus it is difficult to tell whether the particular patient under normal conditions would have had much disturbance or not at the time of the menopause. The second point is this, when one conserves an ovary, it is impossible to predict that it will or will not become infected. This must also be taken into consideration.

In my own experience perhaps I have been unfortunate but I found in several instances that these conserved ovaries have become infected and a second operation had to be done. In three cases it proved to be a very serious affair, and while we may feel at the time of operation that the woman has had an infection, it does not mean that if one conserves the ovary it will become infected. In a great many cases infection is added to the cystic degeneration, and that is where the real danger comes in. I feel with Dr. Polak that many of the patients have less symptoms at the menopause if one conserves the ovary but there is this danger of infection in the conserved ovary and serious complications may follow the subsequent operative procedure.

DR. H. C. COE.—Some interesting physiologic facts have been brought to my attention in a number of patients on whom I operated ten or fifteen years ago. They were entirely relieved of their symptoms for a year or two and they gave the curious history of delayed menopause symptoms for three, four or five years after operation. I question at this time whether the ovaries which previously had not been degenerated, underwent entire atrophy.

DR. JOSEPH BRETTAUER.—This question has been discussed before this Society repeatedly and always with the same result—some for and some against. I agree with Dr. Polak that the question of removing ovaries in a rat or rabbit or dog, and the question of removing ovaries in a human female, are two entirely different propositions, and you cannot make any deductions from one and apply them to the other. The results which Dr. Kross obtained in a limited number of experiments may be all right in rats, but I am not willing to accept them for the human female.

Some ten or twelve years ago I had two series of operations going on for fibroids. I collected 25 perfectly uncomplicated fibroids in which I removed both appendages, and 25 in which I left both appendages, and the after results so far as I could judge, were practically the same in both series. At that time I stated and again repeat that while the number of observations was small, I

would be inclined to remove both ovaries whenever operating for uncomplicated fibroids. I do not operate on this type of case however in a woman under forty, unless there is an absolute indication.

This is the salient point I make again; conservatism before operation. You must differentiate between leaving adnexa in cases operated upon for inflammatory disease, and in cases operated upon for neoplasm. You may find normal ovaries in a case where both tubes are tightly adherent down in the pelvis, and you will leave the pelvis raw and cannot cover it with peritoneum. There is oozing, and the best procedure, to my mind, for the safety of the woman, is to remove the ovaries, because within twenty-four hours they become adherent and are a source of trouble in the future.

Since we are discussing the subject I would like to hear from some of the members who have adopted the method of transplanting some part of an ovary into the abdominal wall after completing the intra-abdominal operation, as advocated by English gynecologists.

DR. KROSS (closing).—I would like to repeat briefly some of the results obtained by Keitler in the work which he has done in hysterectomies. He took a number of cadavers and went through the technic of a hysterectomy in order to test out the possibility of the conservation of the blood supply and he found after doing a hysterectomy, by injecting the blood vessels, that there would be so much spurting through the severed blood vessels that he would have to ligate them and thus interfere with the circulation of the ovary. To obviate this he left in a sliver of the lateral wall of the uterus in an attempt not to interfere with the ascending branch of the uterine artery and the anastomosis between the uterine and the tubo-ovarian arteries and he found even by doing that that he would have spurting, thus necessitating tying off of the blood vessels. He repeated that experiment on several cadavers.

In regard to the menopause symptoms, I would state that Schickele collected a very large series of cases and found that in the normal cases there were menopause symptoms which were practically as severe as in a large series of cases that had been operated on with conservation of the ovaries.

In reference to the benefits and advantages to be gained by conserving the ovaries for even a period of two or three years, I would say that one must place on the other side of the balance sheet the dangers of degeneration, infection and subsequent operations. Dr. Polak in his cases has had 24 per cent of secondary operations, and in all those cases every possible attempt was made to conserve the blood supply. Still 24 per cent of the cases required secondary operations.

I personally think, in view of the large number of secondary operations which must necessarily be done, that it is far wiser to prevent the possibility of having to perform a secondary operation rather than to give the patient the benefit of a few months of more or less doubtful freedom from menopausal symptoms and disturbances.

As far as transplantations are concerned, Graves, in human subjects, has had a number of unfortunate experiences in which he had to remove the transplanted ovary from the abdominal wall. In transplanting the ovary experimentally I have found even with the use of autografts that in the great majority of cases the ovaries have undergone distinct cystic degeneration. In fact, Tuffier, who, I think, has had the greatest experience in transplantation of the ovaries, claims that a transplanted ovary in the absence of a uterus is practically valueless.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

Modern Gynecology and Its Trend Towards Conservative Measures*

BY ROBERT T. FRANK, A.M., M.D., F.A.C.S., DENVER, COLO.

THE gynecology of today is turning more and more toward non-operative methods. This is due in part to the epoch-making discovery of the effects of radio activity, but even more so to a growing dissatisfaction with the functional results of many operations formerly classed as successful. In order to comprehend the full significance of this change, it is necessary to review the development and growth of gynecology and abdominal surgery.

The formative period of operative gynecology, to a great degree, took place in the United States, and as Garrison says in his "Introduction to the History of Medicine,"¹ at least in part had its origin in the attempt to repair the errors and omissions of backwoods obstetrics. In the early days, only the gravest or most incapacitating lesions were attacked.

Only a few of the most important achievements of American gynecologists can be mentioned here. McDowell in 1809 with matchless ingenuity and boldness successfully removed a huge ovarian cyst.² Nathan Smith, of Vermont, and the Atlees in Philadelphia followed in his footsteps. In 1844 Washington Atlee performed a myomectomy. In 1852 J. Marion Sims then of South Carolina, after thirteen unsuccessful attempts upon the same patient, devised a method of cure for a hitherto incurable disease, vesicovaginal fistula.³

Thomas Addis Emmet of Virginia, laid the foundation of plastic repair of the cervix in the sixties.⁴ In 1872 Noeggerath, of New York, published his observations on the importance of latent gonorrhea.⁵ In the same year Battey of Georgia advocated the excision of the ovaries for nonovarian troubles such as dysmenorrhea and neuroses.⁶ In the late seventies, John S. Parry described extrauterine pregnancy. Boze-man of Alabama irrigated the kidney pelvis through the ureters for pyelitis by means of an operatively induced vesicovaginal fistula. Howard Kelly not only simplified this method by the use of his direct cystoscope, but also greatly improved the technic of other kidney operations. John Byrne of Brooklyn successfully removed the cancerous cervix with the cautery and Ries of Chicago fathered the radical removal of the cancerous uterus together with the regional lymphatic glands by means of the modern operation, often called Wertheim's, because this operator stood as its chief exponent.

Until the introduction, acceptance and wide dissemination of Listerian

*Read before the Denver County Medical Society, March 21, 1922.

methods of antisepsis and asepsis, all operations, and especially such as necessitated the invasion of the peritoneal cavity, were hazardous and uncertain. In consequence, surgical practice was concentrated in the hands of a comparatively few bold and skilful men. Some of these operators became marvellously adept. The high mortality rate incident especially to laparotomy, however, acted as a wholesome check and caused even the master surgeons to rigidly refrain from unnecessary interference.

The Period of Asepsis.—Asepsis, in the later decades of the last century, greatly reduced the danger of peritoneal infection.⁷ Improvements in methods of anesthesia, technical advances in every direction, reduced the operative mortality to the vanishing point. As a result of this, surgery was rapidly popularized and widely diffused. The laity lost its fear of operation, and the physician no longer waited for grave conditions to develop, but often interfered early or even prophylactically, as for example in removing a but slightly diseased or normal appendix. Exploratory operations, with all their advantages, as for instance the discovery of malignancy in its veriest incipiency, but with the serious disadvantage of encouraging carelessness in diagnosis, were generally adopted. It was no longer regarded as essential to undergo a long apprenticeship in surgery, if due attention was paid to aseptic technic. Every town and every hamlet throughout the civilized world now boasts of at least one medical man, who can meet surgical emergencies with a greater degree of success than the masters of their craft could do in 1850.

The period extending from 1875-1910, let us say, was thus marked by the popularization of surgery and with it of gynecology. Except in the large university clinics, here and abroad, most men practiced both surgery and gynecology, often without any special training in the closely related branch of obstetrics. Although the advances, and acquirements in gynecology have most often been made by trained gynecologists, their adoption and use more often has fallen to the general surgeon. The result has been an ever increasing number of operations, some necessary, some unnecessary; some successful, some unsuccessful; some upon the right patient, others upon the wrong one. Gynecology has been by no means free of the "crazes" which have marked various periods of medicine.

It is wholesome to take stock of some of these crazes which have swept along the unthinking in times gone by, just as they carry them along today. For there is usually some germ of truth, a valuable kernel hidden somewhere, in each of these seeming aberrations. A few examples will suffice. At one time, before the operative era had developed, every ill that woman was heir to was ascribed to displacements of the uterus. These troubles according to Graily Hewitt, Velpeau, Hodge and others could be cured by the pessary. Today some of our younger colleagues, I am sorry to say, have gone to the opposite extreme and have forgotten the value of the pessary, a most useful instrument, which may tide a woman over her years of child-bearing, or save an old decrepit patient from the dangers of a reparative operation. The "Battey" craze, which consisted in castrating women for every possible condition, sterility excepted, is an example of "crowd hysteria" rarely equalled in the annals of medicine. Reputable surgeons would appear at medical gath-

erings proudly exhibiting quart-sized mason jars filled with human ovaries.

One of the least justified crazes I can myself dimly recall toward its end, Apostoli's intrauterine faradization for uterine fibroids. The method was not even harmless, infection of submucous growths not infrequently resulting from the manipulation.

A craze now well on the wane is the one based on the theory that sterility in women is mainly due to a mechanical stenosis of the cervix. Hence dilatation and dissection, splitting of the cervix, plastic operations on the cervix, or the stem pessary were used indiscriminately. Today we are beginning to see that most of our successes, for striking results were obtained in some instances, were due to temporary or permanent drainage of an inflamed cervical canal.

The craze of today is based on the theory that all diseases result from disturbance of the ductless glands. This theory too harbors more than a modicum of truth and value. We may be in a position to justly evaluate it ten years from today, when the wheat has been sifted from the chaff.

Careful follow-up methods have shown that the surgeon who brashly boasted that his operations for hernia were never followed by recurrence, that his vaginal plastic work was invariably successful, that his radical removal of diseased adnexa relieved all patients of their pains and aches, was either mistaken or wilfully misrepresented results. We can largely thank Codman of Boston for insisting upon our taking stock. The American College of Surgeons, by demanding routine examination of all material removed at operation, has also added another wholesome check upon reckless and unnecessary interferences. It has thus become evident that many operations though well executed and technically perfect, do not accomplish what they are supposed to or reputed to do.

Thus curettage does not cure the leucorrhea, backache and profuse bleeding of "endometritis," largely because these symptoms may be respectively due to cervical infection, to sacroiliac or other joint strain, or to ovarian disease.

The treatment of acute pelvic infections by surgical methods, except the evacuations of pus accumulations, has been generally abandoned, because in the acute stage, if radical operation is unavoidable, the operative mortality is increased and the residual exudates produce protracted invalidism.

The radical operation for cancer of the uterus, in spite of saving many a life, is disappointing. Of all patients suffering from cancer of the uterine cervix only about half, when first seen by the surgeon, can still be subjected to operation. In the best of hands only one woman out of five can be cured.

Formerly it was the invariable custom to curet the uterus for septic abortion, for retained secundines postpartum, for puerperal sepsis. Today this barbarous practice has been generally abandoned, with the result that many women who were doomed by meddling surgery recover spontaneously.

Not only have physicians become more analytical of their results, the public too has grown skeptical. Patients are no longer satisfied to escape with their lives. The more intelligent also demand to be relieved of their suffering. If in spite of operation no relief is obtained, the

patient may seek aid from Christian Science, chiropractics or some other cult. Moreover he proselytes his friends, who follow in his wake. Victims of misapplied surgery largely help to swell the ranks of the various "pathies," "practices" and "antis" of today. These hordes are a menace to the community, because they prevent the enactment of hygienic measures such as compulsory vaccination laws, because they compel the legislatures to admit unqualified sectarians to practice medicine, and because they advocate measures which hamper research.

The present era, just dawning, shows a healthy reaction toward conservation. The "consigne" of today is *functional restoration*. Not only the pathologist but also the physiologist and chemist are called in consultation. Various physical therapeutic methods have been resuscitated and adopted. The new serology has been called to our aid. As in other fields of medicine the refinements of diagnosis, which have been added to our armamentarium, help to avoid unnecessary operation.

It is feasible in this article to touch only upon a few of the more important changes in practice.

Radiotherapy is one of the greatest aids to the modern gynecologists. The x-ray enables him to control, by moderating or entirely abolishing ovarian function, functional uterine bleedings, so common around the menopause and puberty. Of the 50 per cent of uterine fibroids which require any treatment, from 10 to 25 per cent can be rendered innocuous by the Roentgen ray. This is of greatest advantage in patients who because of heart, pulmonary, or kidney disease, are poor operative risks.

The combined use of radium and x-ray in cervical cancer has already revolutionized the treatment of this fatal disease. Such masters of operative technic as Döderlein of Munich and Bumm of Berlin have abandoned the scalpel in favor of the ray. I personally, will resort to operation only in very early cases, and, even in these, prefer to give preliminary radiation. Sarcoma of the uterus is even more amenable to radiotherapy than carcinoma. It should not be forgotten that diagnosis in the early stages, as well as the early institution of treatment, is as essential today as heretofore.

The treatment of pelvic inflammations is now definitely nonoperative until full chronicity has been reached. This signifies that such measures as prolonged rest, parenteral exhibition of foreign protein (typhoid vaccine, caseine, turpentine fixation abscess) and application of high degrees of heat (dry air up to 250°-300° F.) are used, respectively to localize the process, to increase the resistance of the body, and to favor absorption of inflammatory products.⁸ When accumulations of pus occur, they are evacuated per vaginam or extraperitoneally above Poupert's ligament. Chronic pus tubes, which resist these measures, are eventually extirpated. Disability, due to adhesions or persistent exudate, responds well to dry heat, to massage, and to stretching by means of the colpeurynter weighted with mercury. Plastic operations on the tubes, performed with the expectation of restoring fertility, have proved disappointing.

Tuberculosis of the genitals and peritoneum appears to respond more certainly to hygienic measures and to heliotherapy than to radical removal. Exceptions to this are unencapsulated, serous types of tuberculous peritonitis, in which the fallopian tubes and the appendix, if tuberculous, should be excised at the time the fluid is evacuated, and massive

tuberculous pus tubes in patients with only latent pulmonary trouble.

The aim, therefore, in all types of pelvic inflammation, is to refrain from operation unless the disease fails to respond to prolonged application of conservative treatment. But if operation is performed, radical extirpation is indicated. The excuse for operation, frequently advanced, is that women of the working class cannot afford the loss of time necessary for treatment, that prolonged invalidism is a luxury of the rich. Only too often, however, operation is *followed* by prolonged invalidism.

Even greater conservatism is now applicable in *puerperal infections* since convincing evidence has been produced that Nature can wall off and overcome infective processes. That much misused instrument, the curet, is again being relegated to the purpose for which it was reinvented, namely to extract suspect particles from the interior of the uterus for examination by the pathologist. Hysterectomy for puerperal infections and ligation of the pelvic veins are now rarely performed.

The cause of a number of minor ailments was formerly ascribed to "endometritis" and treated empirically. Today much research has been devoted to discover the basic causes and to devise proper measures for relief. Chief among these ailments are leucorrhea, backache and a feeling of weakness.

Leucorrhea, or chronic vaginal discharge, may be due to gonorrheal, colon bacillus or other infection, most often cervical in origin. Marked anemia or severe systemic disease, by changing the substrat of the vaginal flora, may cause annoying discharges. The cause, in a given case, must be determined. *Uterine curettage rarely if ever cures a leucorrhea.*

Backache, in a small number of cases, is due to retroflexion of the uterus when the misplaced organ is engorged or adherent. In a certain number of women retroflexion is congenital and produces no symptoms.

As in men, backache is usually of static origin, or a part symptom of general enteroptosis. Proper shoes, proper posture, proper corset are more often curative than some operations for displacement of the uterus.

Repair of cervical lacerations is indicated only if the cervix is inflamed, produces too much secretion, or repeatedly causes abortion. The bogey of the lacerated cervix as a starting place for cancer has been much overworked. Relaxation of the vaginal outlet, unless accompanied by a marked degree of cystocele, rectocele or descent of the uterus, requires no treatment during the childbearing period. Much more reparative work is being done than is really needed.

Ovarian tumors, however, because of their potential malignancy, should as a rule be removed as soon as their presence is ascertained, before they have had time to become adherent, or, if malignant, to cause metastases.

With the exceptions of ovarian growths, therefore, operative treatment is less often called for than formerly. Emergencies such as excessive uterine bleeding from abortion or submucous tumor, an ovarian growth with twisted pedicle, a ruptured extrauterine pregnancy, a foudroyant appendicitis, today, as heretofore, require immediate surgical intervention.

I have sought to show that accuracy in diagnosis, rigid selection of cases, a sound grounding in the pathology of gynecological ailments, and the use of a few new therapeutic measures should reduce the indications for operative intervention, and yet increase the functional cures.

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MAJESTIC BUILDING.

Selected Abstracts

Toxemia of Pregnancy

McIlroy, A. Louise: Some Observations on the Investigation of the Toxemias of Pregnancy. *British Medical Journal*, March 4, 1922, No. 3192, 335.

The author stresses the importance of antenatal supervision relative to toxemias and also gives an outline of a scheme for the investigation of the toxemias of pregnancy. The pregnancy cases are registered in the out-patient department. Those presenting symptoms of toxemia are admitted to hospital wards for further investigation and treatment. Close examination of the urine in pregnancy is of the greatest importance. Blood examination is also of great importance. Bacteriologic examinations relative to toxemias have given little information. The general principles of treatment are rest; protein-free diet; careful attention to teeth; removal of oral infection; abundance of fluids and alkalies. Interruption of pregnancy is an acknowledgment of therapeutic failure. The conclusions are as follows: Severe conditions are preventable by proper supervision. There should be an adequate number of antenatal beds in maternity hospitals. Research along these lines should be stimulated.

F. L. ADAIR.

Mackenzie Wallis: The Toxemias of Pregnancy, with Special Reference to the Value of Certain Renal Function Tests in Diagnosis. *The Journal of Obstetrics and Gynecology of the British Empire*, 1921, xxviii, 3.

The author has succeeded in establishing several diagnostic tests of value in differentiating the toxemias of pregnancy from nephritis. The methods are

given in excellent detail. Four tests, the diastase content of the urine, the urea content of the blood, the urea concentration test and the ratio of albumen to globulin in the urine are found to be of value.

The increased ability of the urine to digest starch due to an increase in the elimination of diastase, was found to be the earliest sign of the onset of toxemia. Both the toxic vomiting and the eclamptic cases bore this out. In contradistinction, the kidney of nephritis shows a decreased ability to eliminate diastase and the blood concentration of ferment is increased, the urine concentration decreased. Since the first change in the kidney in eclampsia is a swelling of the capillary walls in the glomeruli, it is assumed that the increased diastase elimination and the appearance of globulin in the urine are due to this pathology. In nephritis, damage to the renal epithelium accounts for the decreased diastase elimination.

The urea content of the blood in the true toxemias was invariably within the limits of normal 0.02 to 0.05 gm. per cent, while diminished renal function as present in nephritis gave high concentrations. The excess of urea was of no prognostic significance as regards threatened uremia. It was of prognostic value in the convalescence. The urea concentration test of MacLean is of value in the nephritic cases. After the ingestion of fifteen gm. of urea the percentage in the urine at the end of one hour should be two per cent. One and one-half per cent indicates moderate kidney damage, one per cent, severe. These low concentrations were not found in eclampsia.

The author found that the urine of eclamptics contained a relatively greater amount of globulin than did the urines of nephritics. The proportion of albumen to globulin in eclampsia was 2 to 1, in nephritis 6 to 1. As this test is complicated, for clinical purposes a simple method is used. It consists apparently of the comparison of the simple heat test for albumen with the precipitation of globulin when dilute acetic acid is added to urine.

In none of the toxemias of pregnancy was any evidence of hyperglycemia or glycosuria found. This is definite evidence against the ductless gland theory of origin for toxemia. The author suggests that the investigation of every suspected case of toxemia begin with the examination of a fresh specimen of urine for albumen, globulin, casts, and the diastase content. The latter he considers the most valuable single test for this condition.

H. W. SHUTTER.

Williams: Increased Amount of Uric Acid in the Blood in the Toxemias of Pregnancy. *Journal American Medical Association*, 1921, lxxvi, 1297.

Compared with normal pregnant women, Williams found a marked increase in the amount of uric acid contained in the blood of women suffering from eclampsia, preeclamptic toxemia and hyperemesis gravidarum. Even in those women in whom the only symptom was a high blood pressure, an increase in uric acid was found. He thinks that toxic vomiting of pregnancy may thus be differentiated from vomiting of nervous origin.

R. E. WOBUS.

Hirst, B. C.: The Etiology and Treatment of Eclampsia. *New York Medical Journal*, 1921, cxiv, 377.

The author considers briefly the numerous theories of the etiology of eclampsia. He believes that eclampsia is a toxemia, and that the origin of the toxins is mainly in the fetal body—to a less degree in the placenta. Fetal excretory products throw a considerable burden on the mother's eliminative organs; when these are further overburdened by a heavy proteid diet, an inactive skin and

sluggish bowels, a breakdown is likely to occur. In carefully controlled patients, the incidence of eclampsia may be reduced to a minimum by antenatal care, including a diet light in proteins, preservation of normal skin action and regulation of the bowels. In treating eclampsia, the author combines eliminative measures with sedatives and means to reduce the blood pressure. Diaphoresis and catharsis are supplemented by gastric and colon lavage. Fluid is supplied by proctoclysis. Morphin is used only when the convulsions are violent and frequent and is considered harmful in a comatose patient with convulsions only at long intervals. High blood pressure is combated by veratrum viride, routine venesection of 16 ounces when the systolic pressure is over 180, and puncture of the membranes if the woman is undelivered. Operative treatment by cesarean section is reserved for cases in which these methods have been carried out without progress in labor and without improvement.

Eighty-nine cases treated in five years had a maternal mortality of 21.3 per cent and infant mortality of 36 per cent. Fourteen cesarean sections showed a maternal mortality of 14 per cent, an infant mortality of 34 per cent. Five cases were cured without delivery.

MARGARET SCHULZE.

Moore: Puerperal Eclampsia. Journal of Indiana State Medical Association, 1921, xiv, 305.

The author notes that practically no two writers agree as to the cause of eclampsia and discusses only the most widely advocated theories. Renal insufficiency does not seem to be the sole cause because many cases with albuminuria and high blood pressure do not develop eclampsia. There are no significant kidney lesions at autopsy, and many cases of renal insufficiency do not develop convulsions. The urea disturbance appears to be more of a liver than a kidney insufficiency. There is evidence that oxidation in the entire body is decreased. Theories attributing the toxicity to the fetus are without definite proof. The same holds true of theories concerning the placenta. If these add to the toxicity it is perhaps due to the adding of excessive products of metabolism to the maternal blood. Theories concerning the ductless glands are speculative with some points in their favor.

The author doubts if there is any specific poison present in eclampsia, but rather believes that it is due to faulty elimination by all the excretory organs, first the bowels, second the kidneys, third the skin. The nervous reaction of the individual patient towards the products of metabolism must be considered. This would account for those cases of high blood pressure, etc., who do not have eclampsia. The author believes eclampsia preventable except in presence of chronic Bright's disease. The treatment is advocated as first, preventative; second, palliative; and third, curative. The author's treatment is outlined.

W. K. FOSTER.

Paramore: Eclampsia and Its Incidence. The Lancet, 1921, cci, 1147.

The author's conception is that maternal visceral lesions found in eclamptics explain the toxemia, that the visceral lesions, precede eclampsia and are not merely terminal events.

He believes the toxemia which ends in eclampsia is simply an aberration of normal metabolism and eclampsia simply a uremia distinguishable from other acute uremias only in the method of its production. In his opinion the maternal kidney and liver lesions are due to an ischemia, a necrosis due to the shutting off of the blood supply by pressure. The pressure is an exaggerated intraabdominal pressure produced in certain cases of pregnancy.

Mention is made of experiments which prove the increase in intraabdominal pressure. The fact that eclampsia occurs far more frequently in primiparae, in cases of multiple pregnancy and hydramnios is also discussed.

Postpartum eclampsia he believes, must be attributed to the effects of labor on viscera prone to such disease.

NORMAN F. MILLER.

Mack: Hyperemesis Gravidarum. Zeitschrift für Geburtshilfe und Gynäkologie, 1920, lxxxiii, 27.

The author gives an extensive discussion of the numerous theories of the etiology of this disease, grouping them into those of reflex neurosis, functional neurosis, intoxication and bacterial infection. His personal conclusion from a study of 50 cases occurring in the Giessener clinic during a period of 15 years is that it is a maternal intoxication caused by the ovum. An hysterical tendency may be a predisposing or additional cause. Treatment should be carried out in a hospital, with complete rest in bed, proctoclysis with Ringer's solution and bromides. Teaspoonful doses of iced milk are gradually increased as tolerated, then eggs and "zwieback", later gruels. If no improvement, normal pregnant serum may be used. Psychic control of the patient is most important. Therapeutic abortion should not be too long delayed in the severe and progressive cases. If the general condition grows worse and in addition to acetone and diacetic acid in the urine, pulse and temperature rise and the sensorium becomes clouded, the pregnancy should be terminated. Vaginal hysterotomy is the best, since it is the most rapid, method of abortion.

MARGARET SCHULZE.

Hurst: The Hysterical Nature of the So-called Pernicious Vomiting of Pregnancy. The Lancet, 1922, ciii, 528.

The author is of the opinion that pernicious vomiting of pregnancy is always hysterical except where associated with eclampsia and acute yellow atrophy. He believes the condition curable by properly applied psychotherapy.

He reports two cases both presenting the clinical picture of a severe pernicious vomiting. Both had a very high ammonia coefficient. By the use of psychotherapy the condition in these cases was cured.

Hurst is of the opinion that the high ammonia coefficient and excess of diacetic acid is due to starvation rather than a toxemia. These findings do not occur in starvation where fluids have been liberally taken.

NORMAN F. MILLER.

Falk: A Further Contribution to Hypnotism in Obstetrics and Gynecology. Zentralblatt für Gynäkologie, 1922, xlv, 658.

Falk adds to the testimony of Schultze-Rhonhof as to the value of hypnotism in obstetrics and gynecology. While the former dealt largely with the results at the time of labor, Falk instances remarkable results in other fields, notably seven cases of severe hyperemesis gravidarum, two of which had been sent to the clinic for the termination of pregnancy. Only one was refractory; the other six were completely healed by suggestion, the most severe case showing the promptest recovery. This was a twenty-six year old, third-para, in the third month of pregnancy. She was in a very serious state, having vomited from the first day of the pregnancy. After one treatment she was improved, and within a few days had recovered her appetite and was free from nausea. The mental condition was also markedly improved. She is now within one month of her labor.

Likewise in dysmenorrhea most remarkable results are reported, 13 out of 16 cases being practically cured by suggestion.

Little is said of the technic of the treatment, but one case reported is of extreme interest. A twenty-year-old nullipara, with normal genitalia, had, since puberty, profuse menstruation and in the past two years, periods lasting 10 to 14 days. She was very anemic and suffered from headache. All the usual treatment had been tried without results. At the first sitting, in an interval between periods, she was hypnotized to complete amnesia, and it was impressed upon her that the periods would never last longer than three full days, and that, as soon as the three days were passed, the blood would be directed to the vessels of the limbs. This suggestion was repeated on three successive days, and the patient was instructed to return after the subsequent menstruation. She knew nothing of what had been said while she was under the hypnotic influence. A few days later she reported that the period had lasted but three days, and it is interesting that she then complained of severe pains in the limbs. Three subsequent menstruations have lasted only three days, and the headache has disappeared.

A further case, of sexual frigidity, was also reported as completely cured by suggestion under hypnosis.

LITTLE.

Liepmann and Schulz: Newer Results in Placenta and Eclampsia Research.
Deutsche Medizinische Wochenschrift, 1921, xlvii, 1417.

In previous researches, Liepmann and his collaborators had demonstrated that the placenta contains both a glycolytic and a peptolytic ferment. They also found that placentas from eclamptic patients manifested a toxic action on rabbits not produced by normal placenta. Strangely enough, placenta from a patient who had numerous attacks of convulsion was less toxic than from one who had only one attack, as if the poison had already been spent in the former. By certain precipitins, these placental constituents were demonstrated in the patients' blood.

In the present work, solutions of dextrose and of casein as well as diluted cow's milk were dialyzed through fresh normal placentas at body temperature. In each case there occurred a retention of from 25 to 40 per cent within the placenta. In placentas, inactivated for two hours at 75° C., the retention was practically nil. In using placentas from eclamptic and pre-eclamptic patients, however, it was found that instead of being diminished as in the normal placenta, the amount of nitrogen transfused was actually increased, up to over 700 per cent, while the amount of sugar was diminished even to a greater extent than in normal placentas. This seemed to show that not only the transfused protein is digested in the placenta, but that, in addition, a variable amount of amino-acids and other nitrogen products are given off by the placenta itself, at any rate in the case of an abnormal placenta. Since the placenta thus appears to be the source of toxins in eclampsia, the authors are of the opinion that any form of treatment which does not include emptying the uterus, is illogical.

R. E. WOBUS.

Phillips: Acute Hepatic Toxemia Complicating Pregnancy and Labor. *Journal of Obstetrics and Gynecology of the British Empire*, 1921, xxviii, 124.

The chief infecting organism attacking the liver during pregnancy and labor is the colon bacillus, less common the staphylococcus and streptococcus. Five reported cases are considered to be infections of the liver. Two cases suggest the possibility of delayed chloroform poisoning, the pertinent symptoms not

appearing until after its use at delivery. One received the anesthetic over a period of eight hours. The three remaining cases conform more to a general type. The onset of symptoms was at or about the onset of labor. The findings were: nausea, vomiting (material frequently stained with old blood), jaundice, clay colored stools, biliurine, mental symptoms from early irritability to coma and a positive culture of colon bacilli in the urine. The author believes that the common attacks in pregnant women of malaise associated with muddy complexion, scarcely amounting to jaundice, are mild types of the same infection. Three of the cases recovered. Autopsy on one case showed a liver weighing 36 ounces. Microscopically the midzone of the liver lobule showed marked degenerative changes, the periphery was not markedly involved.

Chloroform was the anesthetic used in all the deliveries. Labor was induced in two cases because of disproportion. Attention is called to the difficulty of diagnosis between malignant jaundice, acute yellow atrophy and this group of ascending infections of the bile ducts. Treatment is directed to the upkeep of the body fluids and elimination.

H. W. SHUTTER.

Harding: Nausea and Vomiting in Pregnancy. *The Lancet*, 1921, cci, 327.

A little over two years ago Duncan and the author put forward the theory that the nausea and vomiting of early pregnancy was due to a deficiency of glycogen in the maternal liver. This deficiency being either absolute or relative, i. e., actually lower than normal in amount or lowered relatively to the fat requirement of the maternal and fetal organs. In their present paper they extend and amplify the contention of the previous report. Their work up to date is based on nearly two hundred cases which have been treated by carbohydrate feeding.

They believe that the primary etiologic factor in nausea and vomiting of pregnancy is a lack of glycogen in the liver of the mother. Intestinal intoxication and neurosis are mentioned as secondary factors.

In treating these cases it is advised that the glycogen supply of the maternal liver be kept as high as possible by means of a rich carbohydrate diet. It is also advised to reduce the amount of fat in the diet for some time. The feeding of a high carbohydrate diet is best accomplished by giving a series of small meals, five or six in number. Such diet, however, should not be continued too long. They believe that no fear need exist regarding any possible retardation or lack of fetal growth because of this treatment.

In the more severe cases where food cannot be taken by mouth they advocate the use of 10 per cent glucose solution per rectum, and occasionally if the condition indicates, one liter of sterile 5 per cent glucose solution made up with normal saline, intravenously. The glucose enemata should be continued in most cases until the urine becomes acetone free.

NORMAN F. MILLER.

Titus and Givens: Intravenous Injections of Glucose in Toxemia of Pregnancy.
Journal American Medical Association, 1922, lxxviii, 92.

It has been assumed that the toxemia of pregnancy may be due to a deficiency of carbohydrates in the system and, more specifically, of glycogen in the liver. This is thought to lead directly to a degeneration of the liver parenchyma. In case of excessive vomiting, and the consequent starvation, this deficiency becomes more acute. Further, it has been shown that after carbohydrate starvation, an animal is more vulnerable to a variety of poisons. The work of Davis, Hall and Whipple has demonstrated that pathologic changes in the liver, produced

by almost fatal doses of poisons, disappear rapidly after the ingestion of carbohydrates. It is also pertinent that not only chloroform poisoning, but simple starvation as well, cause changes in the liver somewhat similar to those found in the toxemia of pregnancy.

Upon this theory, Titus and his associates have based as a logical treatment of the toxemia of pregnancy, the ingestion of an abundance of carbohydrates. In the milder cases, this is done by feeding the patient frequently on a diet rich in sugars. In the more severe cases, they have injected a solution of glucose directly into the bloodstream with rather uniformly beneficial result. In the cases of eclampsia, they have reduced their mortality to one-half of what it was under the recognized conservative treatment. They think that the livers of patients who had been treated by glucose injections, but died in spite of this treatment, showed definite reparative changes. The kidney changes, which, of course, are not affected by this treatment and may be the ultimate cause of death, are thought, by these authors, to be secondary, resulting from the liver changes.

The dose has been gradually increased so that at present they inject from 50 to 75 gms. of glucose dissolved in from 250 to 500 c.c. of water. The dose is repeated after the sugar has been stored, as determined by blood sugar determinations.

R. E. WOBUS.

Paddock: Treatment of Hyperemesis Gravidarum by the Duodenal Tube. *Journal American Medical Association*, 1922, lxxviii, 1611.

Paddock believes that by feeding through the duodenal tube in severe cases of the vomiting of pregnancy we can avoid emptying the uterus in order to give relief. He begins by feeding glucose solution by the drop method a few hours after passing the tube. When the tube has settled in place, he gives feedings of glucose solution, milk, water and such medicaments as bromides. It takes from 4 to 24 hours for the tube to enter the duodenum. After this, he claims, the treatment is easy. He also reports his third case successfully treated by this method.

R. E. WOBUS.

Klots: Two Cases of Hyperemesis Gravidarum. *Nederlandsch Tijdschrift voor Geneeskunde*, 1921, ii, 2791.

A woman was brought in from the country on account of excessive vomiting. She was in the fifth month of her first pregnancy and had always been in good health until she became pregnant, since then she has been vomiting. On admission she was found to be greatly emaciated, her pulse was 130 and temperature 101.5. The urine contained albumin.

While her pulse improved slightly under hypodermic administration of digitalis, her general condition showed no improvement, so that an abortion was decided upon. Under general narcosis, the cervix was dilated with Hegar's dilators, with which it was very difficult to pass the internal os. While this was in progress, the patient suddenly stopped breathing, upon which the procedure was stopped. After 20 minutes, breathing was reestablished and the patient was put to bed. Much to the surprise of Klots, she forthwith got well and, in due time, was delivered of a healthy boy.

Eight months later Klots had a similar case, in which he used dilatation as a therapeutic measure. Again he found the internal os unyielding and again he had the same result, namely a healthy child at full term.

Klots admits that two cases do not prove anything but, since Copeman had

previously advised dilatation of the os internum for hyperemesis and since these two cases prove that the dilatation of the internal os does not necessarily produce abortion, he feels that this simple therapeutic measure is worthy of further trial in otherwise hopeless cases.

R. E. WOBUS.

Vinson: Oesophageal Stricture Following the Vomiting of Pregnancy. Surgery, Gynecology and Obstetrics, 1921, xxxiii, 412.

Spontaneous rupture of the esophagus following prolonged periods of vomiting are not unknown but Vinson finds no record of such accidents following the vomiting of pregnancy. He, therefore, describes six cases which presented themselves at the Mayo clinic on account of esophageal stricture which came on after protracted periods of vomiting during pregnancy. In most of the cases the dysphagia did not come on until some time after the vomiting had ceased but in several of the cases the probable injury was indicated by attacks of pain and the vomiting of blood or dark material.

R. E. WOBUS.

Hügel: Treatment of Eclampsia with Strong Solution of Sugar. Muenchener Medizinische Wochenschrift, 1921, lxxviii, 916.

In his earlier experimental work the author discovered that strong solutions of sugar retarded the coagulability of blood better than other crystalloid solutions without destruction of the blood corpuscles. Employing this fact he treated several cases of eclampsia both with and without convulsions with intravenous injection of 10 per cent glucose solution, and reports very favorably on its efficacy in relieving the symptoms. He uses it in conjunction with immediate emptying of the uterus. From 500 to 1000 c.c. of the 10 per cent solution are (very slowly) injected in the median vein at 36° C.

It is suggested that by employing a sugar diet during pregnancy the threatening eclampsia may be prevented from developing.

S. B. SOLHAUG.

Davis: The Treatment of the Toxemia of Early and Late Pregnancy. Journal American Medical Association, 1921, lxxvi, 1811.

Davis differentiates between the toxemia of early and late pregnancy. In early pregnancy, he assumes, chorionic and syncytial cells are freely discharged into the blood stream of the mother and her immunizing powers overwhelmed by this process while after the formation of the placenta, the pathologic process responsible for the toxemia, is located in the placenta itself. The nervous phenomena, he thinks, are due directly to a disturbance of digestion and assimilation.

In early pregnancy, he advises rest, both mental and physical, stomach lavage with warm sodium bicarbonate solution one to three times daily until vomiting ceases; bowel lavage with the same solution; warm sponge baths; woolen blankets; 5 per cent sodium bicarbonate and 5 per cent glucose are given, 4 to 6 oz. every 4 or 6 hours. The patient is allowed, however, to drink as much water—plain, saline or carbonated—as she desires. Retroversion, if present, is corrected, —if necessary, under ether narcosis. As the condition improves, food is allowed very gradually.

In the late cases, he begins with venesection and transfusion. He then irrigates the stomach, leaving from 1 to 2½ grs. calomel. The bowels are irrigated with hot sodium bicarbonate solution. He advocates dry heat to induce perspiration but deplores wet packs. Morphine and atropine are used only if absolutely

necessary. Unless the woman is already in labor, he does not believe in emptying the uterus, as a rule. If, in multiparae, the cervix is partially dilated, he ruptures the membranes to expedite delivery, while in primigravidae threatened with convulsions, he frequently performs cesarean section.

In all cases, blood pressure, pulse rate and the chemical examination of urine and blood should be a guide to treatment and in all serious cases consultation should be sought.

R. E. WOBUS.

Hirst, John C.: The Intravenous Use of Corpus Luteum Extract in Nausea of Pregnancy. Journal of American Medical Association, 1920, lxxv, No. 12, p. 772.

Hirst believes that the intravenous injection of corpus luteum is the ideal method of administration in the treatment of the nausea of pregnancy. He has used this method in many hundred cases for the last two years. The following reasons are advanced for the use of this method:—(1) Rapidity of absorption. (2) Possible and advisable to use a considerable larger dose than is possible with the intramuscular injection in which more than 1 c.c. causes considerable local reaction. (3) Each ampule contains only 0.2 gm. of the extract and in this way the necessary total quantity can be introduced more easily and quickly. (4) There is no local reaction or discomfort of any kind after the injection. (5) The vomiting is often promptly controlled in cases in which the intramuscular use has failed. The dosage will vary depending upon the type of case under treatment. One patient aborted within 24 hours after the injection was given and this was the only one in whom abortion seemed to have resulted from the treatment. Hirst believes, however, that anaphylactic reactions need not be feared. The presence of goiter in early pregnancy absolutely contraindicates the administration of corpus luteum either intravenously or intramuscularly for the control of nausea. In his experience every such patient has been made much worse by this treatment.

C. O. MALAND.

Chelnisse: Corpus Luteum Extract in Hyperemesis Gravidarum. La Presse Medicale, April 16, 1921, p. 306.

The author points out that it is about fifteen years since M. G. Stella proposed the treatment of pernicious vomiting of pregnancy with ovarian extract. He says that in the last few years ovarian therapy has been taken up in the United States and France by more precise methods, namely, the injection of extract of corpus luteum. The intramuscular and intravenous use of the extract has given favorable results. It is usually productive of no harm but should not be used in cases having a goitre.

F. L. ADAIR.